

3.0001 *Neocylloepus*, A New Genus From Texas and Central America (Coleoptera: Dryopoidea: Elmidae)

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INTRODUCTION

In 1882, Sharp described a new elmid species from Guatemala under the name *Elmis sculptipennis*. His description was based upon “. . . a single, rather immature individual,” collected by Champion from the Rio Naranjo. After examining this type specimen at the British Museum (Natural History) and studying eleven additional specimens he had collected in central Mexico, Hinton (1940) redescribed the species under the name *Cylloepus sculptipennis* (Sharp). He pointed out that the genus *Elmis*, as now restricted, is confined to the Old World. He also clarified and redefined the genus *Cylloepus*, describing the larva and some new species. His larval description was based upon two specimens from Mexico and one from Bolivia. Bertrand (1955) presented a figure of the entire larva—presumably that of *C. montanus* Grouvelle—drawn from specimens collected by Meinert in Venezuela in 1891 and preserved in the Zoological Museum of Copenhagen.

Upon working through my own dryopoid collections, I find that I have, among several hundred specimens of *Cylloepus*, a total of 142 adult specimens readily identifiable in Hinton's key as *C. sculptipennis*. Geographically they range from Devil's River, Texas (south of Juno) to the Isthmus of Panama. Although this represents a considerable extension of the known distribution, my interest was focused upon them because of a new type of larva which was associated with them. Ninety-one specimens of this larva were taken in collections with these adults all the way from Texas to the Isthmus of Panama, only four such larvae being taken in the absence of such an adult (adults were collected a few miles away). The larvae were of appropriate size to produce these adults, and no other “contenders” were present (i.e., genera for which the larval types were unknown). I had little choice but to conclude that these larvae were the immature stages of “*Cylloepus*” *sculptipennis*, despite the fact that they were quite unlike the larvae heretofore attributed to *Cylloepus*. My initial surmise was that perhaps Hinton and Bertrand had been mistaken in identifying their larvae as those of *Cylloepus*, since their larval type was strikingly different from the larvae of such presumed closely related genera as *Elsianus* and *Stenelmis*, whereas my new larvae were obviously very similar to both of these. However, the fact that my specimens were so unlike the larvae

reasonably attributed to *Cylloepus* forced me to make a careful examination of the adults. This examination, in turn, revealed the fact that the group under consideration simply represents a distinct genus—one which is apparently closer to several other genera, in fact, than to either *Elmis* or *Cylloepus*.

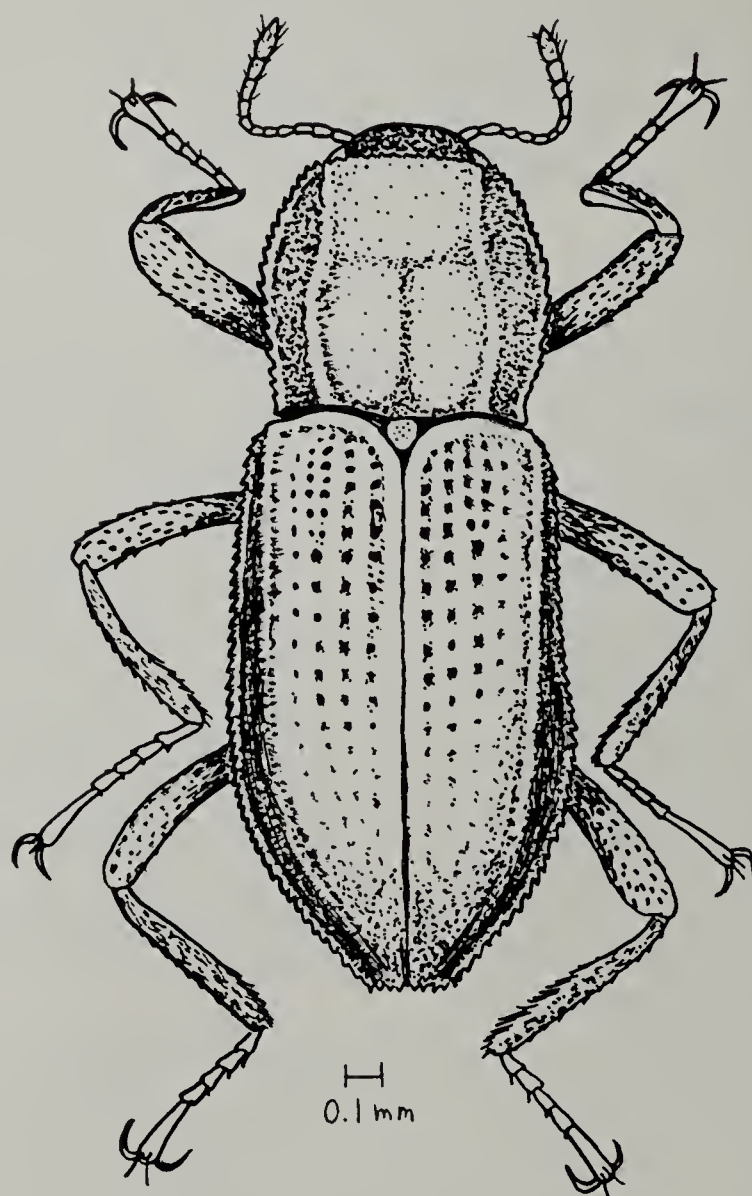


Fig. 1. *Neocylloepus sculptipennis* (Sharp). Adult to show general appearance. Drawn from specimen collected near Somoto, Nicaragua.

Neocylloepus, New Genus

Body elongate, subparallel, moderately convex (Fig. 1). Dorsal surface covered with short, fine, recumbent, brownish hairs which are relatively sparse. Tomentum confined to genae, sides of sterna, sternites (except in center of first and sometimes second sternites, epipleura, and legs except tarsi (sparse on trochanter and tibia).

Head completely retractable, with lateral notch in prothorax at anterior margin of notopleural suture to accommodate antenna. Antenna 11-segmented, approximately the same length as the pronotum. Labrum transverse, slightly arcuate apically; angles broadly rounded with both blunt and pointed bristles (Fig. 2). Mandible with three subacute apical teeth; with an anteriorly directed ventrolateral lobe; prostheca large, membranous, with hairy margin and spiny apex (Fig. 3). Maxillary palp 4-segmented, galea palpiform, 2-segmented, with apical and lateral spines, and almost as long as palp; lacinia with prominent spines forming a mesial row and an apical brush (Fig. 6). Labial palp stubby, 3-segmented, with only the terminal segment longer than broad; ligula with short, rather blunt spines near apex on each side (Fig. 5). Mentum transverse, not quite as broad or as long as submentum; gula posteriorly much narrower than submentum.

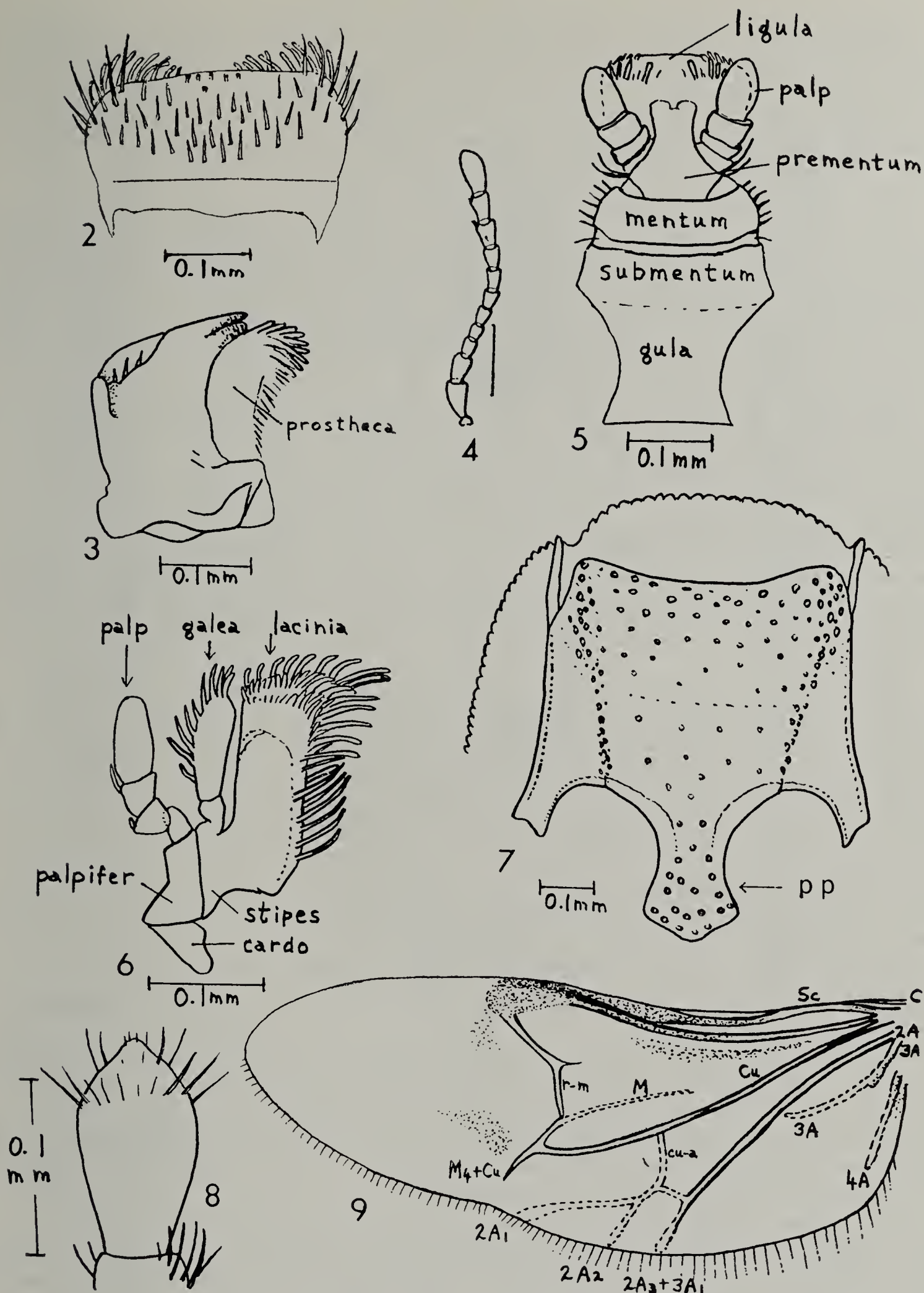


Fig. 2. Labrum of adult female *N. boeseli* sp. n., dorsal aspect.

Fig. 3. Mandible of adult female *N. boeseli* sp. n. The third apical tooth, which is subacute, is hidden by the outer tooth.

Fig. 4. Antenna of *N. hintoni* sp. n. Scale line—0.2 mm. (From Hinton, 1940.)

Fig. 5. Labium of adult female *N. boeseli* sp. n., ventral aspect.

Fig. 6. Right maxilla of adult female *N. boeseli* sp. n., ventral aspect.

Fig. 7. Prosternum of adult female *N. boeseli* sp. n. (pp—prosternal process).

Fig. 8. Apical antennal segment of adult female *N. sandersoni* sp. n.

Fig. 9. Wing of *N. boeseli* sp. n. to show venation.

Pronotum with a sublateral longitudinal carina on each side extending from base to apex; with a median longitudinal impression extending from base three-fifths of the distance toward anterior margin. This impression, which is usually widest at the base, terminates in a transverse impression which is quite discrete in some specimens but very obsolete in others. The pronotum is broadest at about basal two-fifths, at which point it is approximately as broad as long; broader at base than at apex.

Elytra striate and punctuate; without apparent accessory striae or with an accessory stria at base of third; with one sublateral carina but no other conspicuous elevations. Hind wing without radial cross vein or anal cell; first anal absent; second anal with three branches, joined to cubitus by cubitoanal crossvein; third anal without a branch (or with a slight vestige of one) and sometimes not quite attaining second anal; fourth anal well developed; medial before junction with radiomedial crossvein present but obsolete; subcosta may fuse with costa near base as well as distally (Fig. 9).

Prosternum very long in front of procoxae; prosternal process long, slightly dilated toward apex (Fig. 7). Mesosternum with a deep groove for reception of prosternal process. Metasternum with a median longitudinal impressed line. First abdominal sternite with a median depression bounded laterally by a tuberculate longitudinal carina on each side. This depression occupies virtually all the space between the metacoxal cavities. Posterolateral margin of fifth abdominal sternite prolonged on each side to form a dorsally projecting tooth which engages a slight notch at the apical end of the elytral epipleura, serving to hold the elytra firmly against the abdomen. Legs with the visible portion of the procoxae rounded and trochantin completely concealed by the epimeron and episternum. Claws without teeth.

Alimentary canal with six caeca on the anterior margin of the midgut (Fig. 10). As nearly as I can tell, there are six Malpighian tubules, two arising from each side and two ventrally. Those on the left extend anteriorly fully half the length of the midgut, then loop and return to the hindgut where they lie attached to or partially embedded in the wall of the gut throughout most of its descending loop (on the outside) and all of its ascending loop. The two Malpighian tubules on the right also first pass anteriorly, but usually not as far as those on the left, then return to become attached to the wall of the rectum (Fig. 10). The remaining pair, after passing anteriorly, returns to extend along the inner margin of the descending loop of the hindgut and the outer margin of the ascending loop, terminating on the ventral wall of the rectum. (The material at hand is not ideal for dissection, and I have had considerable difficulty making out this much detail. It is possible that there are additional, even more fragile tubules which I have been unable to trace.)

Central nervous system (Fig. 13) with three discrete thoracic ganglia, the first being largest and broadest and connected to the subesophageal ganglion by a very short double cord. The paired cords are distinctly separated in the thoracic region, apparently fused in the abdominal. The first abdominal ganglion is almost fused with the third thoracic; the second, third, and fourth abdominal ganglia are free; the fifth, sixth, seventh, and eighth are fused into a single elongate tear-shaped ganglion.

Male reproductive system (Fig. 14): each testis composed of two ovoid or saccate sperm tubes; vasa efferentia short and inconspicuous; lateral descending portion of vas deferens mildly convoluted, loop and ascending portion enlarged to form an elongate tubular seminal vesicle; median lateral accessory glands small, saccate, dorsal, directed posteriorly; lateral accessory glands relatively large, bulging posterolaterally, forming a tight coil anteromedially. Male genitalia (Figs. 23-34) of the trilobate type characteristic of dryopoids, the basal piece decurved and distinctly longer than the penis or parameres.

Fig. 10. Alimentary tract of adult *N. boeseli* sp. n., dorsal aspect. Only three of the six caeca at the anterior margin of the midgut are visible. Key to abbreviations: *c*—caecum, *hg*—hindgut, *mg*—midgut, *M t*—Malpighian tubule.

Fig. 11. *N. hintoni* sp. n. Adult to show general appearance. (From Hinton, 1940.)

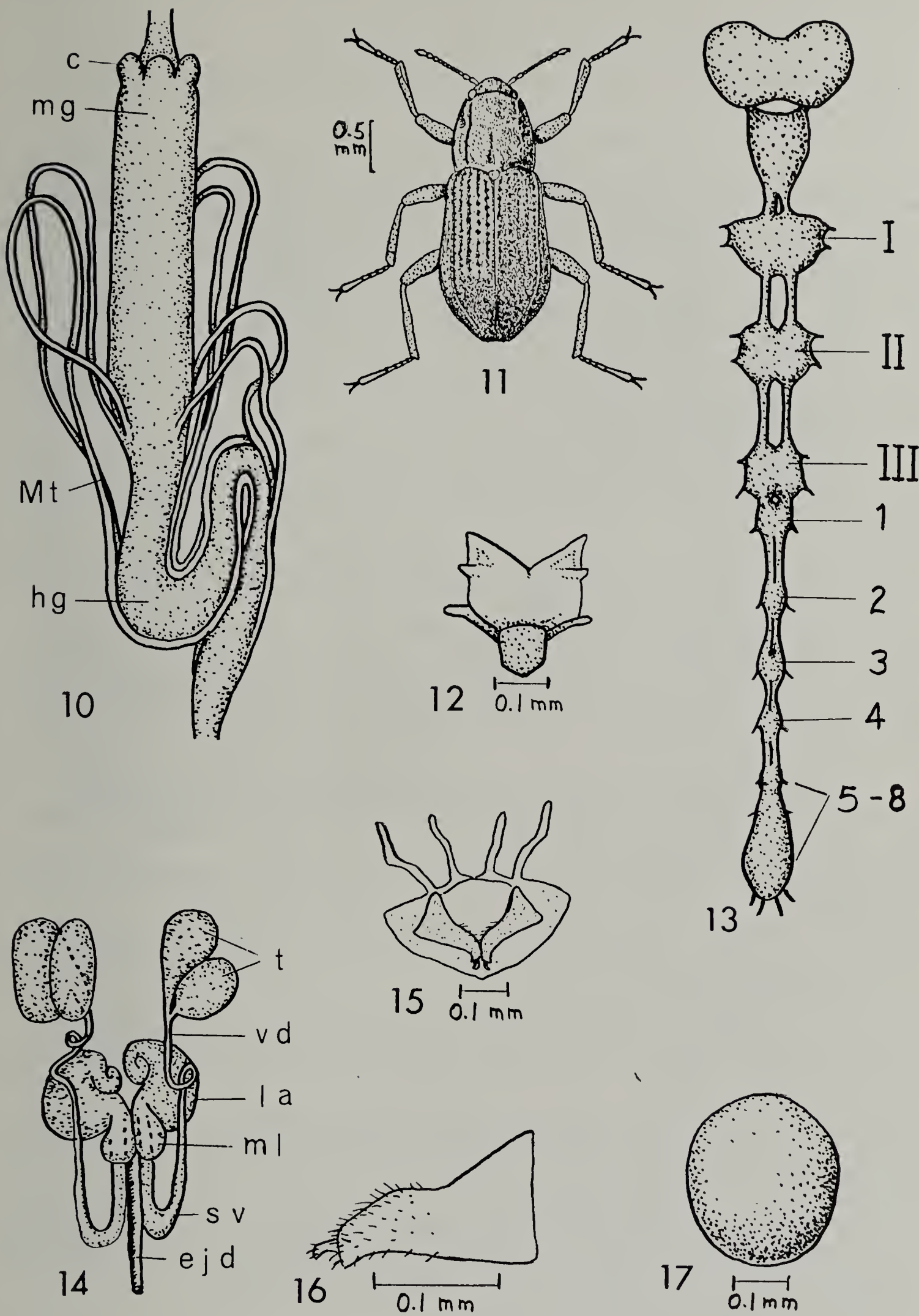


Fig. 12. Scutellum of *N. sculptipennis* (Sharp) from Somoto, Nicaragua. Only the lower pentagonal portion of the figure is externally visible and described in the text.

Fig. 13. Central nervous system of adult *N. boeseli* sp. n. Thoracic ganglia are indicated by Roman numerals, abdominal ganglia by Arabic numerals.

Fig. 14. Male reproductive system of *N. boeseli* sp. n., dorsal aspect. Key to abbreviations: *t*—lobes of testis, *vd*—vas deferens, *la*—lateral accessory gland, *ml*—median lateral accessory gland, *sv*—seminal vesicle, *ejd*—ejaculatory duct.

Fig. 15. Female genitalia of *N. boeseli* sp. n., dorsal aspect.

Fig. 16. Enlarged view of right stylus (coxite) of female genitalia of *N. boeseli* sp. n., dorsal aspect.

Fig. 17. Egg of *N. boeseli* sp. n., dorsal aspect.

I am uncertain as to some details of the female reproductive system, since virtually every specimen dissected was distended with eggs (Fig. 19), as many as 17 large eggs (Fig. 17) being present in a single specimen. Two egg tubes were detectable in each ovary of the specimen figured, but perhaps others were already emptied and no longer apparent. In the only female dissected which was not so distended (Fig. 18), there were four egg tubes visible in the right ovary but only three in the left. The spermatheca is convoluted, the spermathecal gland inconspicuous and elongate. I have not found a distinct bursa copulatrix; either the spermatheca opens directly into the vagina or perhaps the posterior portion of what I consider the spermatheca is actually a bursa. The female genitalia (Figs. 15, 16, 19-21) are inconspicuous and delicate.

The most conspicuous secondary sexual characters are those mentioned by Hinton (1940):

1. the carinae of the first abdominal sternite of the male are usually curved, as if to enclose the median depression, whereas the carinae of the female are typically straight and parallel;
2. the carinae of the male usually extend to the posterior margin of the first sternite, where they are often most prominent; those of the female usually terminate farther forward and are least prominent apically;
3. the median depression of the male usually extends onto the second sternite, whereas that of the female is confined to the first sternite.

I would add the following: the carinae of the prosternum which extend anteriorly from the procoxal cavity are more prominent in the male. In any given locality, the females are generally larger than the males.

GENOTYPE: *Neocylloepus sculptipennis* (Sharp, 1882)

Externally, this genus seems very close to *Cylloepus* Erichson (1847). From *Cylloepus* it differs significantly in the following respects:

1. It has but one sublateral elytral carina. The presence of two may now be considered characteristic of *Cylloepus*.
2. There is a short accessory stria at the base of the third elytral stria. (Perhaps this is not a generic feature. Hinton did not mention or figure it, but all of my specimens in which the striae are discernable seem to exhibit it.)
3. The basal piece of the male genitalia is distinctly longer than the penis or parameres.
4. In the female, each ovary has no more than four egg tubes rather than about eighteen.
5. The fifth abdominal ganglion is fused with the sixth, seventh, and eighth; in *Cylloepus* as figured by Hinton (1940), it is free.
6. In wing venation, the subcosta is often fused with the costa near the base, there is a considerable vestige of the median, and the third anal vein does not have a second branch and sometimes does not fuse with the second anal.
7. There are six, rather than eight, gastric caeca.
8. The larva (Figs. 35-50) is strikingly different, being much more like that of *Elsanus*, *Micrcylloepus*, or *Stenelmis* than like that attributed to *Cylloepus* by Hinton (1940), Bertrand (1955), et al. Among the ways in which this larva differs from that of *Cylloepus* are the following:
 - a. the thoracic pleurae are divided;
 - b. there is no posterior median prosternal suture;
 - c. the first abdominal segment has both tergo- and sterno-pleural sutures;
 - d. abdominal segments eight and nine without lateral sutures;
 - e. the tergo- and sterno-pleural abdominal sutures converge terminally;
 - f. tergo-pleural thoracic sutures are present.

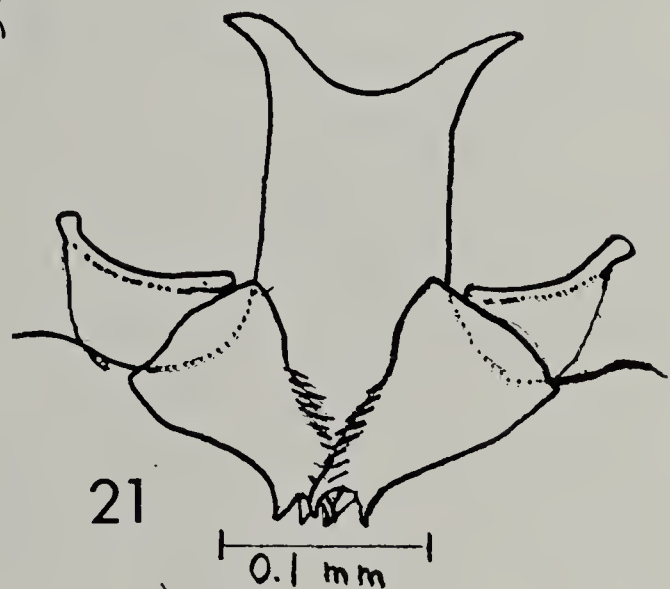
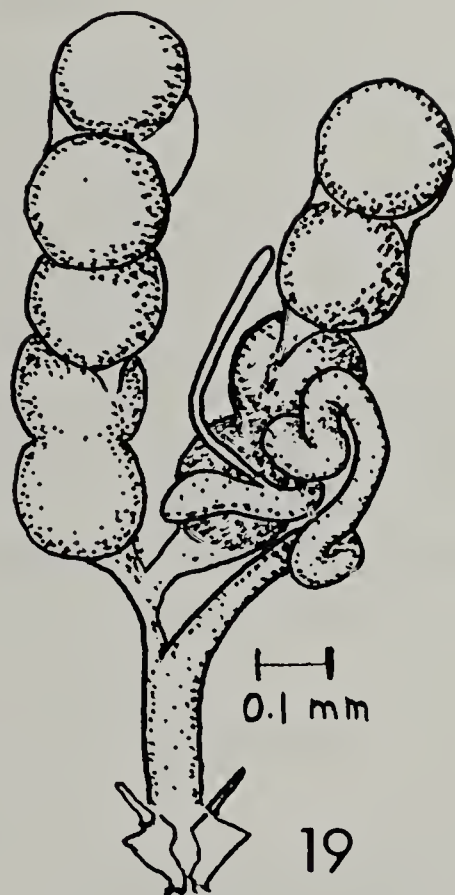
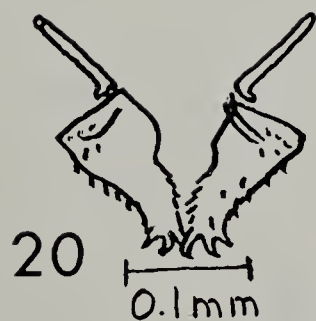
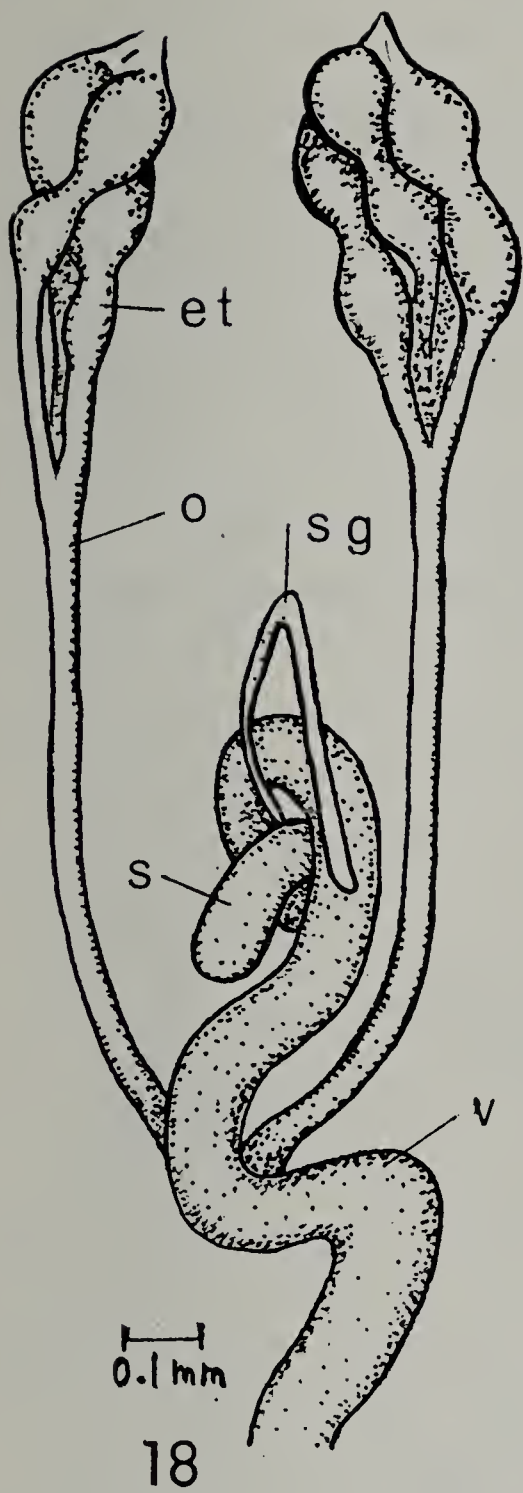


Fig. 18. Female reproductive system of *N. boeseli* sp. n., dorsal aspect. This specimen, collected in May, was the only female dissected in which the ovaries were not excessively distended with eggs. The left ovary consists of three egg tubes, of which only two can be seen; the right ovary has four egg tubes, of which only three are visible. Key to abbreviations: *et*—egg tube of ovary, *o*—lateral oviduct, *s*—spermatheca, *sg*—spermathecal gland, *v*—vagina.

Fig. 19. Female reproductive system of *N. sculptipennis* (Sharp), dorsal aspect. On the left, the anterior three eggs are in one egg tube, the posterior two in another. On the right, the anterior two are in one egg tube, the others in another. In such specimens, some of which have many more eggs, it is difficult or impossible to determine the number or location of the egg tubes.

Fig. 20. Enlarged view of female genitalia of *N. sculptipennis* (Sharp), dorsal aspect.

Fig. 21. Female genitalia of *N. sandersoni* sp. n., dorsal aspect.

Neocylloepus is perhaps closest to *Heterelmis* in wing venation (Fig. 9) and in some details of mouthparts. Its digestive tract also resembles that of *Heterelmis* and that of *Hexacylloepus* in having only six gastric caeca. From both of these it differs in many respects, including the possession of but one sublateral elytral carina. Taking all factors into consideration—internal, external, and larval characters—*Neocylloepus* is probably closest to *Hexacylloepus*.

In the keys of Hinton (1940), adults of *Neocylloepus* key out to *Cylloepus* (but do not fit the description given in the key), larvae to *Elsianus*. In the keys of Leech and Chandler (1963), adults of *Neocylloepus* do not fit the key but would almost run either to *Neoelmis* or to *Microcylloepus*; larvae would most nearly key out to first instars of *Microcylloepus*, but recognizing that mature larvae should not go here, one might key them to *Elsianus*. Arnett's (1963) key is taken from Leech and Chandler's key to adults. In the keys of Leech and Sanderson (1959), adults of *Neocylloepus* key out to *Microcylloepus*, larvae to *Elsianus*. In Bertrand's (1955) larval key, specimens of *Neocylloepus* would probably be identified as either *Elsianus* or *Neoelmis*, although they would not quite fit either set of characters.

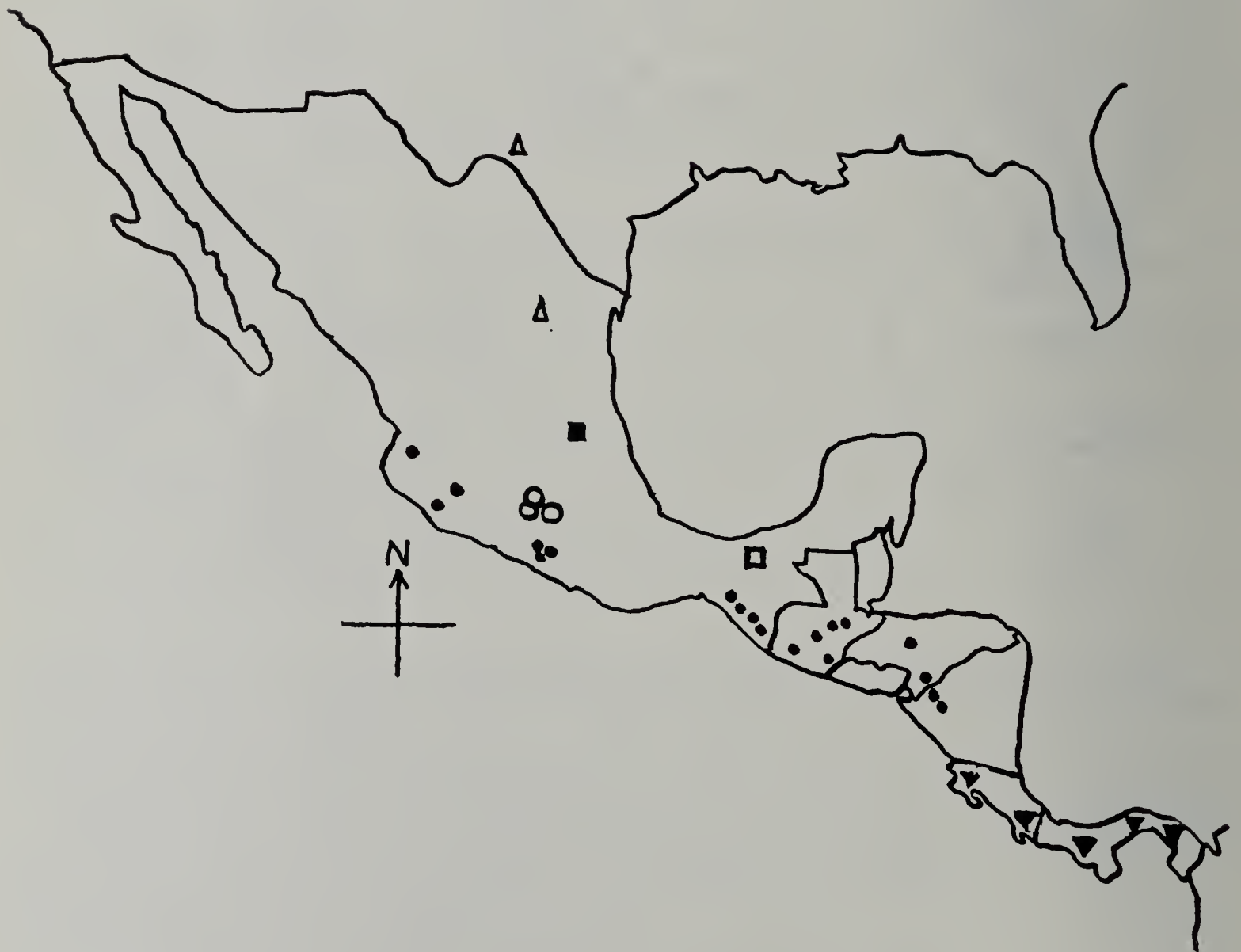


Fig. 22. Distribution map showing localities in which the various species of *Neocylloepus* gen. n. have been collected. *N. arringtoni*—■; *N. boeseli*—△; *N. hintoni*—○; *N. petersoni*—□; *N. sandersoni*—▼; *N. sculptipennis*—●

Since *Neocylloepus* occurs from Texas to Panama (Fig. 22), it is appropriate to indicate where and how it may be inserted in existing keys to the elmids of both the United States and Mexico (no keys exist for the rest of Central America).

KEYS TO GENERA: ADULTS

In the key provided by Leech and Sanderson (1959), on page 1004, replace couplet 98 with a dual couplet as follows:

98a (97)	Each mandible (Fig. 38-47) with a narrow lobe on lateral margin	98c
98b	Mandible without narrow lateral lobe	100
98c (98a)	Each elytron with one sublateral carina; pronotum without oblique sculpturing, but posterior half divided by a median longitudinal furrow	
 (1 species)	Neccylloepus Brown
98d	Each elytron with two sublateral carinae (rarely one in Microcylloepus , which has oblique sculpturing on posterior half of pronotum)	99

In the key of Leech and Chandler (1963), on page 362, replace couplet 20 and add couplet 24 as follows:

20	Each elytron with one sublateral carina; pronotum with oblique sculpturing	24
—	Each elytron with two sublateral carinae (rarely only one in Microcylloepus , which has oblique sculpturing on posterior half of pronotum)	21
24	Pronotum undivided except by a transverse impression at anterior two-fifths (Fig. 13.55a)	Neoelmis Musgrave, 1935
	Neoelmis caesa (LeConte) 1874; 1.6 mm.; testaceous; Texas and Oklahoma	
—	With transverse impression as above, but also with posterior half of pronotum divided by a median longitudinal impression or furrow	Neocylloepus Brown, 1970
	Neccylloepus boeseli Brown 1970; 2.55-3.2 mm.; brown; Devil's River, Texas	

The adaptation of the key of Leech and Chandler (1963) given above will also serve for that of Arnett (1963), page 477, or Fascicle 42:4, except for the reference to the figure. In Hinton's (1940) key to the genera of Mexican Elmini, page 227, change the second part of couplet 3 to read:

"Elytron without accessory striae, or with one at base of third stria (**Neocylloepus** Brown). Each testis composed of one or two sperm tubes 4"

Also, on pages 228-229, replace couplets 7 and 8, and add couplet 11, as follows:

7.	Each elytron with two sublateral carinae (rarely only one in Microcylloepus , in which case, basal half of pronotum with an oblique impression on each side)	8
	Each elytron with only one sublateral carina; without oblique impressions on pronotum	11
8.	Pronotum on apical two-fifths with a moderately deep, occasionally incomplete, transverse impression; with a median longitudinal discal impression; on basal half on each side with an oblique impression. Hypomera with tomentum. Alimentary canal with two caeca on the anterior margin of the midgut; hindgut with six Malpighian tubules. Each ovary with six egg tubes. Central nervous system with the first three abdominal ganglia discrete	Microcylloepus Hinton (1935)
	Pronotum without transverse impression on apical two-fifths. Hypomera usually at least partly tomentose. Alimentary canal with more than three caeca on anterior margin of midgut. Each ovary with more than six egg tubes	9

11. Basal half of pronotum divided by a median longitudinal impression which usually ends in a transverse impression near or anterior to middle of pronotum. Hind wing with second anal three-branched; without an anal lobe. Alimentary canal with six caeca on the anterior margin of the midgut. Central nervous system with only the first four abdominal ganglia discrete ----NORTH and CENTRAL AMERICA ----**Neocylloepus** Brown (1970). Pronotum with a deep and complete transverse impression, but never with a median longitudinal impression on disk. Hind wing with second anal two-branched; with a feebly developed anal lobe. Alimentary canal with three, two, or no caeca on the anterior margin of the midgut. Central nervous system with the first six abdominal ganglia discrete -----NORTH and SOUTH AMERICA, WEST INDIES -----**Neelmis** Musgrave (1935).

The Species of *Neocylloepus*

All of the specimens I have examined are quite similar in general appearance. As best as I can determine, they represent five species in addition to that described by Hinton (1940). At present, female specimens of several species are separable only on the basis of geographic location (Fig. 22) or association with males, since two of the species are represented by unique male specimens.

It is my opinion that the redescription of *N. sculptipennis* (Sharp) given by Hinton (1940) was in fact based upon specimens of a different species, which I am naming *N. hintoni* sp. n. in honor of the describer, Dr. Howard E. Hinton, whose work on neotropical dryopoids has been truly monumental. The description and figures of *N. hintoni* sp. n. presented below are taken from his paper, as are the distribution data. I have not seen these specimens, nor have I examined Sharp's type during the preparation of this paper. Sharp's (1882) type specimen of *N. sculptipennis*, which is in the British Museum of Natural History, was collected by Champion in the Rio Naranjo, Guatemala. I presume that this is probably the Rio Naranjo which flows past Coatepeque, separating the departments of San Marcos and Quezaltenango in southwestern Guatemala, but since I am uncertain as to the location along the stream (or even whether this is the correct stream), I have not indicated the type specimen on the distribution map.

Since two of the six species listed are represented by unique male specimens, the key presented below is based largely upon features of the male genitalia.

Key to Species of *Neocylloepus* Based Primarily Upon Male Genitalia

1. Penis (dorsal aspect) shaped like a slender, long-necked French wine bottle, slightly dilated apically (Fig. 31); pronotal impressions inconspicuous or absent -----
----- (Chiapas, Mexico) ----- **N. petersoni** sp. n.
- Penis not as above (broader or without apical enlargement); one or both pronotal impressions (median and transverse) usually conspicuous ----- 2
- 2(1). Parameres (lateral aspect) rather plump, almost ovate; fulcrum of basal piece not prominent 3
- Parameres more elongate; fulcrum of basal piece rather prominent ----- 4
- 3(2). Penis (dorsal aspect) conspicuously broader than paramere (Fig. 34) -----
(known only from Rio Axtla, S. L. P., Mexico) ----- **N. arringtoni** sp. n.
- Penis rather slender apically (Fig. 28) -----
(highlands of central Mexico) ----- **N. hintoni** sp. n.

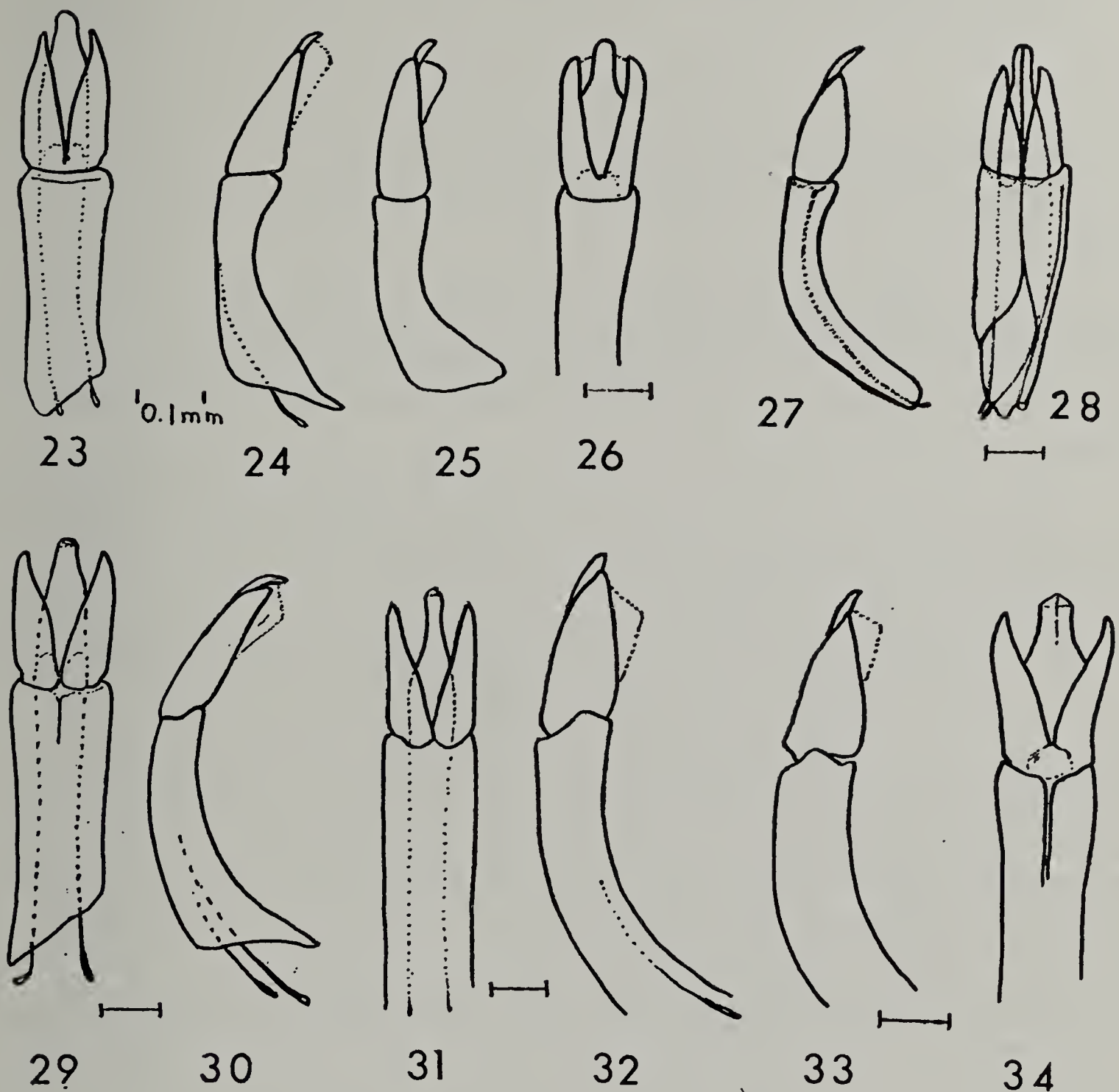


Fig. 23. Male genitalia of *N. sculptipennis* (Sharp), dorsal aspect.

Fig. 24. Male genitalia of *N. sculptipennis* (Sharp), lateral aspect.

Fig. 25. Male genitalia of *N. sandersoni* sp. n., lateral aspect.

Fig. 26. Male genitalia of *N. sandersoni* sp. n., dorsal aspect.

Fig. 27. Male genitalia of *N. hintoni* sp. n., lateral aspect.

Fig. 28. Male genitalia of *N. hintoni* sp. n., dorsal aspect.

Fig. 29. Male genitalia of *N. boeseli* sp. n., dorsal aspect.

Fig. 30. Male genitalia of *N. boeseli* sp. n., lateral aspect.

Fig. 31. Male genitalia of *N. petersoni* sp. n., dorsal aspect.

Fig. 32. Male genitalia of *N. petersoni* sp. n., lateral aspect.

Fig. 33. Male genitalia of *N. arringtoni* sp. n., lateral aspect.

Fig. 34. Male genitalia of *N. arringtoni* sp. n., dorsal aspect.

- 4(2). Parameres (dorsal aspect) apically narrowed or pointed (Fig. 23) -----
 (from western Mexico to Nicaragua) ----- **N. sculptipennis** (Sharp)
 Parameres rather blunt apically ----- 5
- 5(4). Penis (dorsal aspect) narrows abruptly toward apex; parameres hardly taper at all (Fig. 26)
 ----- (Costa Rica, Panama) ----- **N. sandersoni** sp. n.
 Penis narrows gradually; parameres taper noticeably (Fig. 29) -----
 (Texas and northern Mexico) ----- **N. boeseli** sp. n.

DESCRIPTION OF SPECIES

Neocylloepus hintoni n. sp. (Figs. 4, 11, 22, 27, 28)

Synonym: *Cylloepus sculptipennis* (Sharp) in Hinton (1940). Novitates Zool. 42 (2):347.

As stated above, in my opinion the specimens examined and described by Hinton represent not *N. sculptipennis* (Sharp), but a new species which I here-with name in his honor. All material here presented concerning this species is taken directly from his paper (Hinton, 1940), including the description and figures.

"Male: Length, 2.8 mm.; breadth, 1.12 mm. Subparallel, moderately convex. Clothed with fine, recumbent, brownish hairs which are about 0.05 mm. long and arise at intervals equal to more than once their lengths; labrum at sides with the hairs much longer and denser and paler. Cuticle shining and rufopiceous to nearly black; densely and minutely alutaceous on head, pronotum, hypomera, prosternal process, meso- and meta-sternum, all of first abdominal sternite, and sides of sternites two to five. *Head* without distinct impressions; surface densely and very minutely alutaceous so that under a magnification of X 150, it appears to be finely granulate; also set with low and irregularly shaped granules which are slightly finer than facets of eyes and are usually separated by less than to twice their diameters. Clypeus when viewed from in front with the anterior margin feebly and arcuately emarginate for its entire breadth, with the angle on each side broadly rounded; clypeal suture feeble and arcuate; surface similar to that of head but with only the base and sides alutaceous. Labrum with the anterior margin truncate and the angle on each side feebly rounded; surface with punctures which are not more than half as broad as granules of clypeus and are usually separated by less than to once their diameters. *Pronotum* with the broadest point at basal two-fifths and here broader than long (0.85 mm.: 0.80 mm.) and base broader than apex (0.80 mm.: 0.54 mm.). General shape and form and extent of the various impressions as figured (Fig. 11). Surface sculptured as head except for area near inner side of sublateral carinae on basal half, extreme base, and sides near lateral margins which are only feebly or not at all alutaceous. *Elytra* more than twice as long as prothorax (1.87 mm.: 0.80 mm.) and feebly broadening posteriorly to broadest point which is near apical third and which is distinctly broader than broadest point across humeri (1.12 mm.: 1.00 mm.). Lateral margins coarsely and densely crenate. Surface coarsely striate, discal striae finer and shallower as they approach apex but never altogether absent; discal striae punctures subquadrate to round, moderately deep, and at middle of disk as broad as intervals to slightly narrower and separated longitudinally by slightly more than to slightly less than their own diameters; toward sides the punctures become coarser and denser and toward apex finer and sparser. Discal intervals flat, the third at base being only very slightly convex. *Elytra* with only one sublateral carina. Surface of intervals with the granules slightly larger, more convex and more regularly round than those of pronotum and separated usually by one to four times their diameters; sutural interval on basal two-thirds and first four intervals on apical third with only an occasional granule; surface between granules with punctures similar to those of labrum but separated by one to five times their diameters. *Scutellum* flat, subovate, broader than sutural interval near base (0.12 mm.: 0.50 mm.) and as broad as long; surface sculptured as adjacent elytral intervals.

Prosternum with the anterior two-thirds (not including process) moderately strongly but not sharply lobed; surface granulate as elytral intervals except for surface of process which is sculptured as head. Hypomera very densely and regularly alutaceous with only an occasional granule and without tomentum. Mesosternum sculptured as prosternal process. Metasternum with the posterior third of disk only feebly depressed; with a broad (about 0.03 mm.) and deep median longitudinal impression which extends to apical fourth; surface of disk similarly but distinctly more coarsely sculptured than surface of prosternal process; sides of metasternum with the granules only showing through the tomentum and separated by one to three times their diameters, the surface here strongly resembling that of the legs. Abdomen with the carinae of the first abdominal sternite curving slightly inwards, complete from base to apex, and most prominent at apex; first sternite at middle strongly depressed, this depression very shallowly but nevertheless distinctly encroaching to middle of basal third of second sternite; middle of first sternite on basal two-thirds densely and minutely alutaceous and with deep round punctures which are about 0.02 mm. broad and are contiguous to separated by once their diameters; apical third of first sternite and all of middle up to apical four-fifths of fifth sternite not alutaceous and the punctures similar to those of first sternite, but becoming progressively finer as apex of abdomen is approached so that on basal fifth of fifth sternite they are only half as coarse. Sides of abdominal sternites granulate as sides of metasternum. *Genitalia* as figured (Figs. 27, 28).

Female: Externally similar to male except as follows: (1) the carinae of the first abdominal sternite straight and not curved inwards, absent on apical sixth, and least instead of most prominent at apex; and (2) the depression of the middle of the first sternite does not extend on to second sternite.

Specimens (Fig. 22): 8, MEXICO: Estado de Morelos, Cuernavaca, June, 1934; 2, MEXICO: Dist. de Temascaltepec, alt. 6,000-7,000 ft., June, 1934; 1 with same data as above but at Tejupilco, alt. about 4,000 ft., July, 1934. (Type series in British Museum of Natural History.)

Variations: No variations worthy of mention have been noted."

In general, the above description is quite applicable to the remaining species except for size and the features mentioned below or figured as characteristic. For the sake of brevity (and because most of my specimens are encrusted), I shall omit details of microsculpture. However, the following should be noted, not as specific characteristics, but as features probably applicable to all the species at hand: the crenation of elytral margins may present a distinctly serrate appearance before the posteriorly directed setae which crown the crenations become worn off or encrusted; the median depression of the first abdominal sternite varies in depth and in extent within the same sex and species, sometimes encroaching upon the second sternite in females and even upon the third in males; the longitudinal carinae bordering this depression vary considerably in curvature, in extent, and in magnitude in both sexes. In fact, I have been unable to determine the sex of some specimens without recourse to dissection. The median longitudinal furrow or impression and the transverse impression of the pronotum vary markedly, one or both being very distinct in some specimens but obsolete or barely perceptible in others; this difference appears to be one of individual variation within a species, unrelated so far as I can tell to sex, age, size, or locality.

Neocylloepus sculptipennis (Sharp). (Figs. 1, 12, 19, 20, 22, 23, 24)

Synonymy: *Elmis sculptipennis* Sharp. 1882. Biol. Centr.-Amer., Col. 1 (2): 135.

Cylloepus sculptipennis (Sharp) in part. Hinton, 1940. Novitates Zool. 42 (2):347.

Sharp's description is as follows:

Length 2.1 mm., width 1 mm.

Habitat: GUATEMALA, Rio Naranjo, elevation 450 ft. (Champion).

"Thorax elongate, very gently rounded at the sides, and only very slightly narrowed near the hind angles; parallel with the side there is a raised line extending the whole length, and the surface at the base close to the inner side of this line is more deeply impressed; at the base there is a central longitudinal channel extending forward for about half the length of the thorax where it meets a very obsolete transverse depression. Elytra with series of very coarse punctures, the inner of which become obsolete toward the apex, and with a fine, very definite elevated line, extending from the shoulder to the extremity. Metasternum very coarsely granulate; basal ventral segment very deeply impressed on the middle."

Sharp's description, based upon ". . . a single, rather immature individual . . . , " might now better serve as a generic characterization. His specimen was near the minimum size of those I assign to this species, which range from 2.1 to 2.7 mm in length and from 0.85 to 1.1 mm in width. Of 78 adults in my collection, most specimens are between 2.2 and 2.5 mm, individuals from only two of nineteen localities measuring less than 2.2 mm (Arriaga, Chiapas, Mexico, and Teculután, Zacapa, Guatemala) or exceeding 2.5 mm (Francisco Morazán, Honduras, and Madriz, Nicaragua). The descriptions given below are based upon specimens collected near the center of distribution (north of Arriaga, Chiapas, Mexico), about 170 miles northwest of the presumed type locality.

Male: Length, 2.1 mm, breadth, 0.9 mm. Subparallel, moderately convex. Clothed with fine, recumbent, brownish hairs about 0.04 mm long and arising at intervals slightly greater than their length; sides of labrum with hairs much longer, denser, and paler. Cuticle shining, rufo-piceous to piceous. Legs lighter, brownish; antennae still lighter, almost testaceous. *Head* without distinct impressions. Clypeus with anterior margin (viewed from in front) feebly and arcuately emarginate for its entire breadth, with angles broadly rounded; surface similar to that of head. Labrum with the anterior margin rounded; surface glabrous, translucent brown. *Pronotum* 0.70 mm long and 0.70 mm wide, the region of greatest breadth being at the basal third (in other specimens at the basal two-fifths); basal width 0.65 mm, apical width 0.50 mm. Median sulcus distinct, but transverse impression obsolete. *Elytra* 1.50 mm long, 0.825 mm wide at humerus, and 0.90 mm wide at broadest point, which is near middle. Lateral margins crenate to serrate. *Scutellum* flat, subcircular, 0.10 mm in diameter, slightly broader than sutural interval near base. *Prosternum* 0.55 mm long and 0.50 mm wide; prosternal process 0.237 mm long, 0.125 mm wide at its waist (narrowest point), and flaring to a maximal apical width of only 0.137 mm. Margins of prosternal process raised, these ridges continuing about halfway around the anterior edge of the procoxae, then forward as carinae which extend about halfway to the anterior margin of the prosternum. Mesosternum and metasternum sculptured as prosternum. Disc of metasternum feebly depressed; median sulcus abruptly expanding into a depression near apex. *Abdomen* with deep medial depression of first sternite extending shallowly across second sternite. Carinae bordering depression of first sternite most prominent and slightly convergent apically. *Genitalia* as figured (Figs 23, 24).

Female: Generally similar to male, but usually somewhat larger. Carinae of prosternum and first abdominal sternite feebly developed, the latter being obsolete posteriorly, and not convergent. Depression of first abdominal sternite shallow, barely encroaching upon second sternite. Measurements for one specimen from the same locality are: length 2.25 mm, breadth 0.925 mm; pronotum 0.725 mm long and 0.750 mm wide, with basal width of 0.725 mm and apical width of 0.55 mm; elytra 1.61 mm long and 0.8 mm wide at humerus; prosternum 0.625 mm long and 0.6 mm wide, the prosternal process being 0.250 mm long, 0.150 mm at the waist, and 0.175 mm at the apex. *Genitalia* as figured (Figs 19, 20).

Type: Specimen in British Museum (Natural History). GUATEMALA: Rio Naranjo, collected by G. C. Champion.

Specimens (Fig. 22): MEXICO: Estado de Chiapas—north of Arriaga, 2 adults in November, 1964, 17 adults and one larva in October, 1966; between Arriaga and Tonalá, 3 adults in November, 1964; near Ortiz Rubio, 1 adult in November, 1964; south of Las Cruces, 6 adults in October, 1966; Estado de Colima—southeast of Colima, 4 adults in November, 1964; Estado de Guerrero—1 larva near Xaltianguis and 1 near Playon in March, 1969; about 5 km west of El Ocotito, 2 adults and 28 larvae in April, 1969; about 12 km west of El Ocotito, 3 adults and 7 larvae in April, 1969; south of Tierra Colorada, 1 adult and 7 larvae in April, 1969; near El Cuarenta, 2 larvae in April, 1969; Estado de Jalisco—Tamazula, 1 adult in November, 1964; Estado de Nayarit—Ixtlan del Rio, 3 adults in November, 1964. GUATEMALA: Departamenta de Guatemala—northeast of Guatemala City, 5 adults in October, 1966; Departamenta El Progreso—near San Cristobal Acastoquastlan, 1 larva in October, 1966; Departamenta Santa Rosa—Taxisco, 1 adult in November, 1966; Departamenta Suchitepequez—Puente Poca, about 30 miles west of Escuintla, 1 adult in October, 1966; Departamenta Zacapa—Rio Huyus near Teculután, 7 adults in October, 1966. HONDURAS: Departamenta Choluteca—Rio Coco east of El Banquito, 1 adult in November, 1966; Departamenta Francisco Morazán—Rio del Hombre north of Támara, 6 adults in November, 1966. NICARAGUA: Departamenta Estelí—east of Estelí, 1 adult in November, 1966; Departamenta Madriz—Rio Taparcale west of Somoto, 13 adults in October, 1966. These localities range from about 500 to about 5,000 feet in elevation.

Variations: Although the median pronotal furrow is usually distinct and deep, the transverse impression varies from conspicuous to obsolete or imperceptible in both sexes. The widest portion of the pronotum ranges from about the basal one-third to two-fifths, that of the elytra from about the middle to the apical one-third. The carinae of the first abdominal sternite vary enough to render some individuals not even identifiable as to sex on this basis. Flaring of the prosternal process varies considerably, as does the ratio between prosternal length and width. The legs of some specimens exhibit quite a bit of black, especially on the dorsal surfaces. In some specimens, the scutellum is pentagonal with rounded angles (Fig. 12).

Neocylloepus boeseli sp. n. (Figs. 2, 3, 5-7, 9, 10, 13-18, 22, 29, 30, 37-49)

This species is named in honor of Dr. Marion W. Boesel, Professor Emeritus of Zoology at Miami University, Oxford, Ohio, under whom I first studied entomology.

Male: Length, 2.95 mm; breadth, 1.1 mm. Clothed with fine, recumbent, pale hairs which are about 0.03 mm long and arise at intervals equal to or slightly greater than their length; hairs of antennae arising from apical ends of segments, those of terminal segment forming an apical brush; hairs of labrum as shown in Fig. 2, short medially, long laterally, those on the exterior surface being acute except for the very short, blunt, antero-median group, while

those arising beneath the margin are blunt, often curved, and directed medially. Cuticle shining and reddish brown; legs somewhat lighter; antennae rufo-testaceous. *Head* as described for *N. hintoni*. *Pronotum* 0.93 mm long, 0.925 mm wide at broadest point, which is at basal one-third; basal width 0.875 mm and apical width 0.625 mm. *Elytra* 2.1 mm long, 1.0 mm wide across humeri, and broadest near apical third (1.1 mm); margins crenate to serrate. *Scutellum* flat, subovate, 0.150 mm long and 0.115 mm wide, as compared with a sutural interval of about 0.08 mm near base. *Prosternum* (Fig. 7) 0.75 mm long and 0.60 mm wide; prosternal process 0.280 mm long, 0.135 mm wide at waist, and flaring to 0.165 mm apically. Margins of prosternal process raised as in *N. sculptipennis*, the ridges continuing about half-way around the anterior edge of the procoxae, then extending anteriorly as carinae a little more than halfway toward the anterior margin of prosternum. *Metasternum* with disc feebly depressed, but rising from this depression, the margins of the shallow median sulcus are raised in the forward half, gradually sinking to the level of the surrounding depression posteriorly; the median sulcus is relatively inconspicuous. *Abdomen* with concavity of first sternite continuous with depression of metasternum and extending shallowly across second sternite, carinae of first sternite most prominent apically and very slightly convergent. *Genitalia* as figured (Figs. 29, 30), the parameres in lateral aspect being quite slender and elongate.

Female: Similar to male, but generally larger. Prosternum without real carinae, the margins of the prosternal process being scarcely raised. Carinae of first abdominal sternite feeble, obsolete apically, and not perceptibly convergent, sometimes even being slightly divergent. Depression of first abdominal sternite encroaching upon second sternite barely if at all. Measurements for specimen from type locality: length, 3.25 mm; breadth, 1.2 mm; pronotum 1.0 mm long and 1.0 mm wide with basal width of 0.925 mm and apical width of 0.71 mm; elytra 2.35 mm long and 1.1 mm across humeri; prosternum 0.70 mm long and 0.68 mm wide, the prosternal process being 0.30 mm long, 0.125 mm at the waist, and flaring to an apical width of 0.175 mm. Genitalia as figured (Figs. 14, 16).

Type: Male in Stovall Museum of Science and History, Norman, Oklahoma. U. S. A.: Texas—Devil's River about 20 miles south of Juno, Val Verde County, August, 1967. Elevation about 1,200 feet.

Paratypes: 11 adults collected with the type and 13 adults collected in the same locality in May, 1969. Paratypes will be deposited in the U. S. National Museum, Washington, and the collection of the Illinois Natural History Survey, Urbana.

Other specimens (Fig. 22): 5 larvae collected with the type and 28 larvae collected in the same locality in May, 1969. MEXICO: Estado de Nuevo Leon—Rio Ramos about 2 miles southeast of Allende, 2 adults in October, 1964. Elevation about 1,650 feet.

Variations: The transverse impression of the pronotum varies from distinct to obsolete; the median furrow also varies considerably but is perceptible in all specimens. The location of the widest point on both pronotum and elytra varies noticeably, but the general slender aspect of the species is maintained. In addition to the sexual differences mentioned above, the carinae of the prosternum and first abdominal sternite vary markedly in prominence as does the flaring of the prosternal process. In size, this species ranges from 2.55 to 3.25 mm long and 1.0 to 1.2 mm wide, the smallest being one of those from Mexico. Of the last 13 specimens collected, 6 were females, ranging from 2.85 to 3.25 mm in length. In contrast, 5 of the 7 males were 2.8 mm or less, the smallest being 2.75 mm long.

Comparative notes: At the risk of boosting the already adequate ego of Texans, I note the fact that members of this species, especially those from Texas, are larger than those of any other species. Judging from Hinton's (1940) figure and description of *N. hintoni* sp. n. (as *Cylloepus sculptipennis*), I presume that members of the latter species which overlap the size range of *N. boeseli* sp. n. exhibit the relatively compact aspect depicted in Fig. 11, whereas specimens of *N. boeseli* sp. n. are noticeably slenderer (with the well-known lanky Texas figure). All the other species here described have contours essentially like that of *N. hintoni* sp. n. Since the translucent brown color of the cuticle appears in specimens taken both in May and in August, regardless of the amount of encrustation, this may be a useful diagnostic feature, although I suspect that it might be greatly influenced by the chemical composition of the water. The parameres of the male genitalia seen in lateral aspect probably provide the safest diagnostic character.

Neocylloepus sandersoni sp. n. (Figs. 8, 21, 22, 25, 26, 35, 36)

This species is named in honor of Dr. Milton W. Sanderson, Taxonomist for the Illinois State Natural History Survey at Urbana, who first directed my attention to dryopoid beetles and who has done more than any other to elucidate the taxonomy of the Nearctic elmids.

Male: Length, 2.08 mm; breadth, 0.925 mm. Clothed with fine, recumbent, pale hairs which are about 0.04 mm long and arise at intervals approximating this distance; hairs of antennae arising from distal whorls, the terminal segment bearing two subapical whorls (Fig. 8); sides of labrum with hairs much longer and denser. Cuticle shining, reddish brown to rufo-piceous. Legs lighter; antennae yet lighter, rufo-testaceous. *Head* without distinct impressions. Clypeus with anterior margin feebly and arcuately emarginate for its entire breadth, with angles broadly rounded; surface similar to that of head. Labrum truncate. *Pronotum* 0.70 mm long and 0.725 mm wide, the broadest point being at about basal two-fifths; basal width 0.69 mm, apical width 0.50 mm. Median sulcus distinct; transverse impression deep and conspicuous. *Elytra* 1.05 mm long, 0.825 mm across humeri, and 0.925 mm wide at broadest point, which is near middle. Lateral margins crenate to serrate. *Scutellum* flat, pentagonal with rounded angles, 0.10 mm long and 0.085 mm wide; broader than sutural interval near base, which is about 0.065 mm. *Prosternum* 0.59 mm long and 0.063 mm wide; prosternal process 0.25 mm long, 0.142 mm at the waist, flaring to 0.174 mm apically. Margins of prosternal process raised, the ridges continuing about halfway around anterior edges of procoxae, then extending anteriorly as carinae a little more than halfway toward the anterior margin of prosternum. *Metasternum* with disc very feebly depressed; margins of median sulcus slightly raised; median sulcus shallow and inconspicuous, gradually expanding posteriorly. *Abdomen* with concavity of first sternite continuous with depression of metasternum and extending shallowly across second sternite; carinae of first sternite relatively feeble, slightly more prominent and noticeably convergent apically. *Genitalia* as figured (Figs. 25, 26), with penis narrowed abruptly beyond the middle and parameres as seen in dorsal aspect slender and elongate.

Female: Similar to male, but generally larger. Carinae of first abdominal sternite feeble, not extending to apical margin, slightly divergent apically. Depression of first abdominal sternite shallow, not reaching apical margin. Measurements for specimen from type locality: length, 2.20 mm; breadth, 0.97 mm; pronotum 0.737 mm long and 0.775 mm wide with basal width of 0.725 mm and apical width of 0.550 mm; elytra 1.59 mm long and 0.862 mm across humeri; prosternum 0.585 mm long and 0.535 mm wide, the prosternal process being 0.263 mm long, 0.150 mm at the waist, and flaring to 0.175 mm apically. Genitalia as figured (Fig. 21).

Variations: The specimens at hand range from 1.8 to 2.5 mm long and from 0.85 to 1.0 mm wide. As in the other species described, there is considerable variation in the depth of the pronotal impressions, the prominence, curvature, and extent of the carinae of the first abdominal sternite, and the shape of the prosternal process.

Comparative notes: Although the minimal size indicated above might suggest that members of this species are unusually small, the average size is probably close to that of *N. sculptipennis*. The smallest specimen from the type locality (from which the majority of specimens were taken) is 2.25 mm long. The best diagnostic character is the shape of the parameres of the male genitalia as seen in dorsal aspect: they are quite narrow at the base, tapering very little throughout their length. The penis, too, is rather characteristic, narrowing so abruptly as to give a shouldered appearance.

Type: Male in Stovall Museum of Science and History, Norman, Oklahoma. COSTA RICA: Provincia de Puntarenas—small river 4 miles west of Canoas near the Panamanian border, November, 1966. Elevation about 800 feet.

Paratypes (Fig. 22): Twenty adults collected with the type. Six larvae were taken in the same collection. Paratypes will be deposited in the U. S. National Museum, Washington, and the Illinois Natural History Survey, Urbana, Illinois.

Other specimens (Fig. 22): COSTA RICA: Provincia Guanacaste—Rio Piedras west of Bagaces, 1 adult in November, 1966. PANAMA: Provincia Chiriquí—south of Guabalá, 1 adult in November, 1966; Provincia Panama—small stream west of La Chorrera, 6 adults in November, 1966; Rio Pacora north of Pacora, 5 adults and 4 larvae in June, 1968. All elevations less than 1,000 feet.

Neocylloepus petersoni sp. n. (Figs. 22, 31, 32)

This species is named in honor of Dr. Alvah Peterson, Professor Emeritus of Zoology and Entomology, Ohio State University, Columbus.

Male: Length, 2.5 mm; breadth, 1.0 mm. Clothed with fine, recumbent, pale hairs which are about 0.035-0.04 mm long and arise at intervals slightly less than to slightly greater than their length; hairs of antennae most prominent on last few segments, where they are relatively dense; sides of labrum with hairs much longer and denser. Cuticle shining, reddish brown to rufo-piceous. Legs and antennae lighter, rufo-testaceous. *Head* without distinct impressions. Clypeus as in other species. Labrum feebly rounded. *Pronotum* 0.78 mm long and 0.85 mm wide, the broadest point being at about basal two-fifths; basal width 0.80 mm, apical width 0.53 mm. Median furrow shallow, hardly perceptible; transverse impression obsolete, almost imperceptible. *Elytra* 1.80 mm long, 0.925 mm across humeri, and 1.0 mm at widest point, which is between middle and apical third. Lateral margins serrate. *Scutellum* flat, pentagonal with rounded angles, 0.125 mm in both length and width; slightly broader than sutural interval near base. *Prosternum* 0.62 mm long and 0.60 mm wide; prosternal process 0.275 mm long, 0.128 mm at waist, flaring to 0.177 mm apically. Margins of prosternal process raised slightly, the ridges continuing about halfway around anterior edges of procoxae, then extending forward as feeble carinae about halfway toward the anterior margin of prosternum. *Metasternum* with disc feebly depressed; margins of median sulcus moderately raised; median sulcus expanding abruptly near apex. *Abdomen* with concavity of first sternite extending across second sternite; carinae of first sternite apically prominent and convergent. *Genitalia* as figured (Figs. 31, 32), with parameres rather like those of *N. arringtoni* sp. n., but with penis slender and apically elongate, resembling a champagne bottle.

Female: Unknown.

Comparative notes: Since this species is represented by a unique male specimen and since nothing is known of the variations within the species, I can only speculate as to which features mentioned above are characteristic. Judging from the situation in the other species described above, I surmise that the lack of distinct pronotal sulcus and transverse impression may represent mere individual variation rather than valid specific characteristics. As with the other species, the genitalia probably provide the best diagnostic features—the penis in dorsal aspect being conspicuously slenderer toward the apex than that of any other species except *N. hintoni* sp. n., the penis of which is noticeably longer in lateral aspect.

Type: Male in Stovall Museum of Science and History, Norman, Oklahoma. (Fig. 22) MEXICO: Estado de Chiapas—Rio Teapa or a tributary thereof north of Tapilula where the road (Mex. 195) toward Ixhuatan crosses a cataract; December, 1966. Elevation estimated between 3,000 and 4,000 feet.

Neocylloepus arringtoni sp. n. (Figs. 22, 33, 34)

This species is named in honor of Dr. Richard Arrington, Professor of Biology and Dean at Miles College, Birmingham, Alabama, who was the first man to complete a doctoral dissertation based upon the Stovall Museum dryopoid collection.

Male: Length, 2.30 mm; breadth, 0.95 mm. (Vestiture probably as in previous species, but specimen too encrusted to observe details.) Cuticle shining, reddish brown to rufo-piceous; legs and antennae lighter, the later rufo-testaceous. *Head* as in previous species, with similarly emarginate clypeus; labrum feebly rounded. *Pronotum* 0.68 mm long and 0.75 mm wide, the broadest point at about basal one-third; basal width 0.725 mm, apical width 0.55 mm. Median furrow moderately well defined; transverse impression moderately distinct. *Elytra* 1.575 mm long, 0.85 mm across humeri, and 0.95 mm across broadest point, which is near middle. Lateral margins serrate. *Scutellum* flat, ovate, 0.10 mm long and 0.09 mm wide. *Prosternum* 0.604 mm long and 0.575 mm wide; prosternal process 0.25 mm long, 0.121 mm at waist, flaring to 0.163 mm apically. Margins of prosternal process raised, the ridges continuing about halfway around anterior edges of procoxae, then extending forward as carinae about halfway toward the anterior margin of prosternum. *Abdomen* with concavity of first sternite extending across second sternite; carinae of first sternite apically prominent, attaining margin, but only slightly convergent apically. *Genitalia* as figured (Figs. 33, 34), the parameres rather similar to those of *N. petersoni* sp. n. and *N. hintoni* sp. n., but with a broad penis which, in dorsal aspect, resembles a milk bottle.

Female: Unknown.

Comparative notes: This species is also represented by a unique specimen, so nothing can be stated as to variation within the species. Again, the genitalia provide the safest means of identification. The parameres are quite like those of *N. hintoni* sp. n. and *N. petersoni* sp. n., but the penis in dorsal aspect is much broader than that of either of these species.

Type: Male in Stovall Museum of Science and History, Norman, Oklahoma. (Fig. 22) MEXICO: Estado de San Luis Potosi—Rio Axtla about 8 miles north of Matlapa (47 miles south of Ciudad Valles). Elevation about 400 feet.

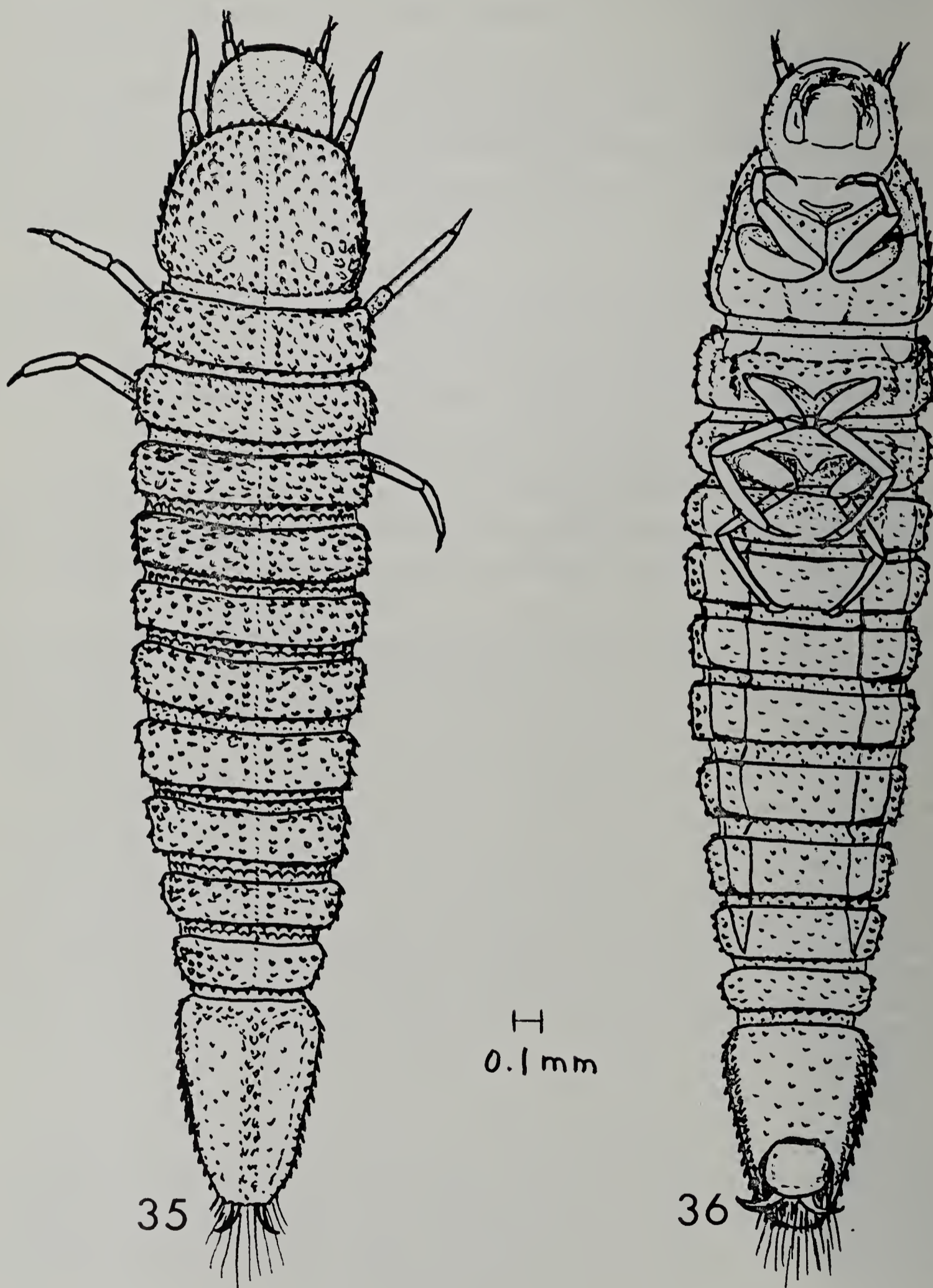


Fig. 35. *N. sandersoni* sp. n., mature larva, dorsal aspect. Drawn from specimen collected near Canoas, Costa Rica.

Fig. 36. *N. sandersoni* sp. n., mature larva, ventral aspect.

LARVAE

As stated in the Introduction, the larvae were identified by elimination and association. They are different from those of any other known genera. They are appropriate in size. They were collected in the presence of adult specimens of *Neocyloepus* eight times in seven different localities ranging all the way from Texas to central Panama. In none of these collections were there adults of other genera which could have been associated with these larvae. In only four localities were these larvae taken in the absence of *Neocyloepus* adults, and in each of these cases (3 in Mexico, 1 in Guatemala), adult specimens of *Neocyloepus* were collected within 25 miles—usually in the same drainage system. The larva is very much like that of *Elsianus* and that of *Stenelmis*—in other words, it is a typical elmid larva. In view of such overwhelming circumstantial evidence, I consider it entirely reasonable to assume that the larvae described below are those of *Neocyloepus*, even though they have not been reared to maturity under controlled conditions.

Generic Characters of Larvae of *Neocyloepus*

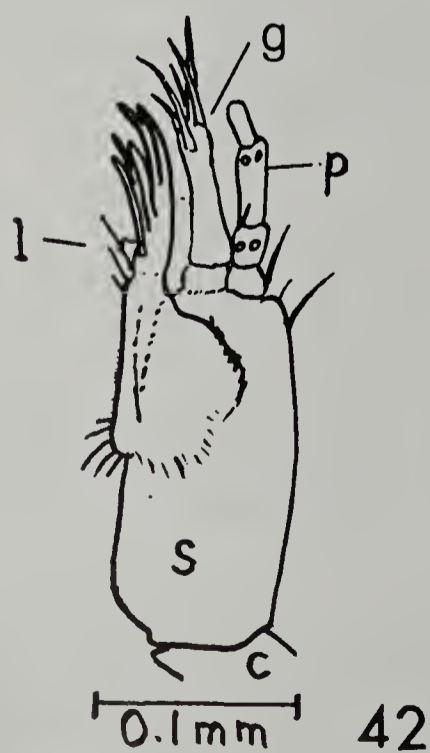
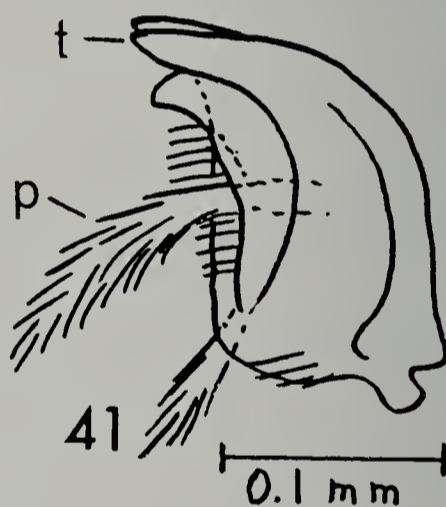
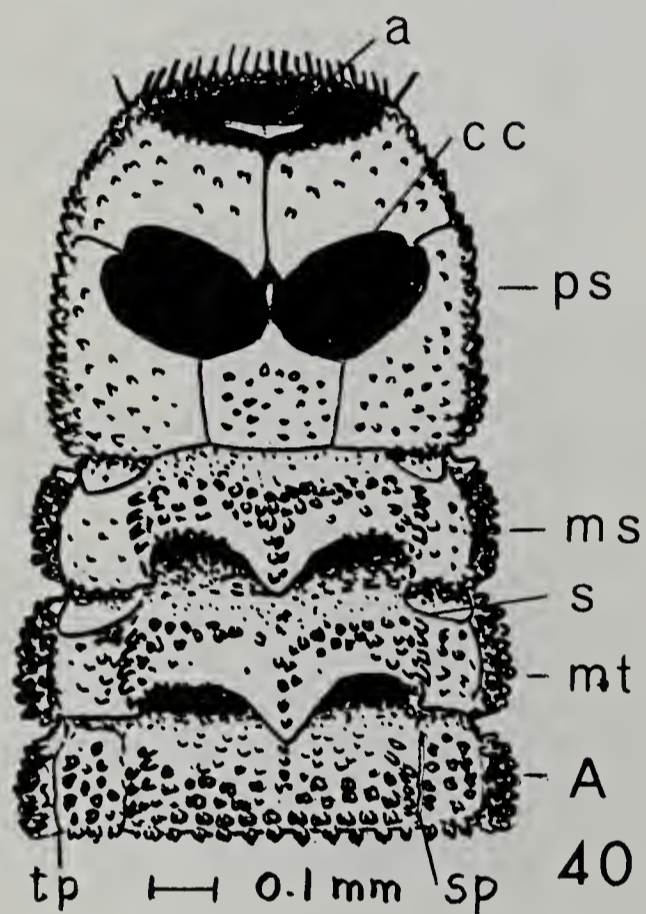
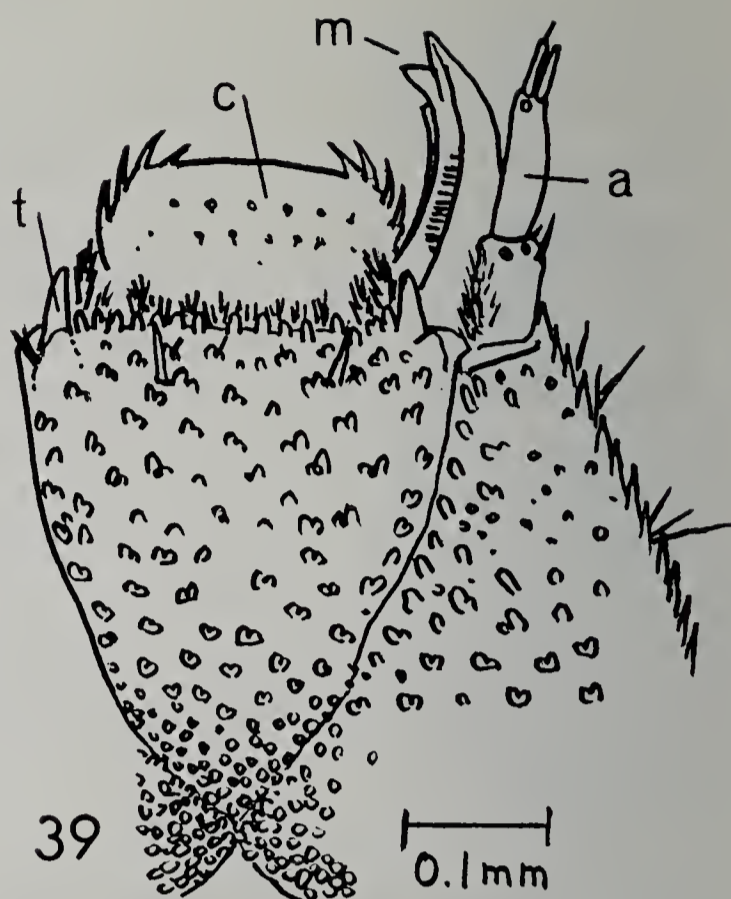
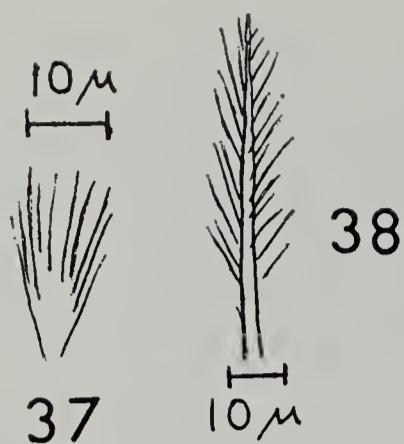
Body subparallel, hemicylindrical to cylindrical except for ninth abdominal segment, which is pentagonal in cross-section (Fig. 50). Cuticle rather opaque, rather densely studded with tubercles.

Head (Figs. 35, 36, 39) exposed, not concealed beneath pronotum; anterior margin with a prominent tooth on each side between clypeus and antenna, with one ocellus on each side. Antennae 3-segmented and feebly retractile; last segment setiform, subequal in size to and side by side with seta arising from apex of second segment. Mandibles (Fig. 41) of both sides similar, each with 3 subacute apical teeth; prostheca long, slender, and densely hirsute. Maxilla (Fig. 42) with palp 4-segmented, stipes showing no differentiation into palpifer; galea and lacinia separate, galea with apical tuft of spines, lacinia with mesial and apical spines. Labium (Fig. 43) with rather elongate mentum, transverse submentum; labial palp 2-segmented; prementum with appreciable palpiger.

Prothorax (Figs. 36, 40) with pleura divided into two parts, the anterior pleura meeting mid-ventrally so that anterior sternum is completely suppressed; posterior sternum well developed; procoxal cavities contiguous, separated by only a minute sclerite. Just anterior to the prothorax in the midventral line is a small, transverse adventitious sclerite. Meso- and metapleura divided into two parts.

Abdomen with pleura of first 7 segments bounded by tergo- and sterno-pleural sutures, segments 8 and 9 forming complete sclerotized rings. Operculum (Figs. 47, 49) of ninth segment with 2 heavily sclerotized claws attached to its dorsal membrane, visible only when the operculum is opened for gill extrusion. Ninth segment (Figs. 35, 36, 47, 48, 50) with 5 longitudinal carinae: median dorsal; paired dorso- and ventro-laterals. *Spiracles* present on mesothorax and first 8 abdominal segments and opening on small tubercles. Tracheae without air sacs. Three tufts of retractile, anal, tracheal gills present: 1 dorsal and paired laterals. *Alimentary canal* with well-developed stomodeal armature (Fig. 46). Other features of the internal anatomy are being investigated by Mr. Edwin A. Green.

The larvae of this genus are similar in many respects to those of *Elsianus*, *Macrelmis*, *Microcyloepus*, *Neoelmis*, *Ordobrevia*, and *Stenelmis*. From all they differ in having median and dorso-lateral carinae on the ninth abdominal segment. Unlike *Ordobrevia* and *Stenelmis*, they have prothoracic pleura distinctly



The most useful and widely used keys to elmids larvae within the United States are those of Leech and Sanderson (1959), in which *Neocylloepus* gen. n. would key out to *Elsianus*, and Leech and Chandler (1963), in which it would key out to *Microcylloepus* (first instar). To add *Neocylloepus* gen. n. to the key of Leech and Sanderson (1959, p. 1017), at the end of 66b delete "*Elsianus* Sharp" and insert "66c"; then insert a couplet as follows:

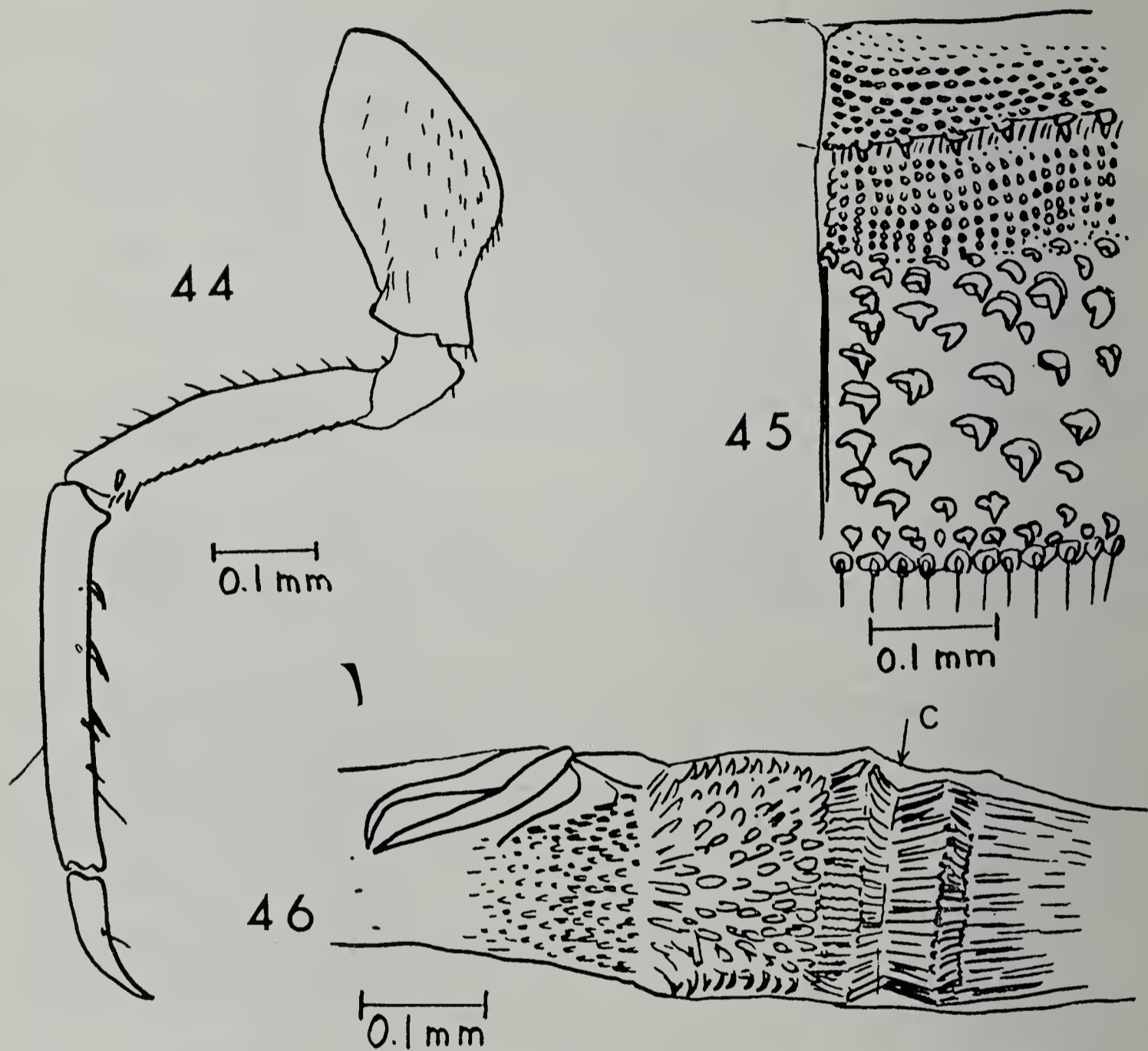


Fig. 44. *N. boeseli* sp. n., right mesothoracic leg of larva, ventral aspect.

Fig. 45. *N. boeseli* sp. n., a portion of the fourth abdominal tergite of larva, dorsal aspect, to show arrangement of tubercles. Mid-dorsal ecdysial line at left, anterior margin at top, posterior margin at bottom.

Fig. 46. *N. boeseli* sp. n., stomodeal armature of larva viewed from the right side. The cervical region is indicated by the letter *c*; the portion to the right of *c* is located in the head, that to the left of *c* being in the prothorax.

- 66c (66) Ninth abdominal segment with a median dorsal carina and on each side a longitudinal dorsolateral carina; integument rough and granular; with a small, median, transverse accessory sclerite just anterior to prosternum **Neocylloepus** Brown
- 66d Ninth abdominal segment without dorsal or dorso-lateral carinae; integument rather smooth; without accessory sclerite ahead of prosternum **Elsianus** Sharp

To add *Neocylloepus* gen. n. to the key of Leech and Chandler (1963, p. 360), modify the first half of couplet 21 by deleting “(first instars of) . . . *Microcylloepus* Hinton 1935” and replacing this with the numeral 24; then insert at the end of the key a couplet as follows:

- 24 Anterior margin of head on each side with a conspicuous tooth between clypeus and antenna **Neocylloepus** Brown 1970
 Anterior margin of head without such teeth
first instar of **Microcylloepus** Hinton 1935

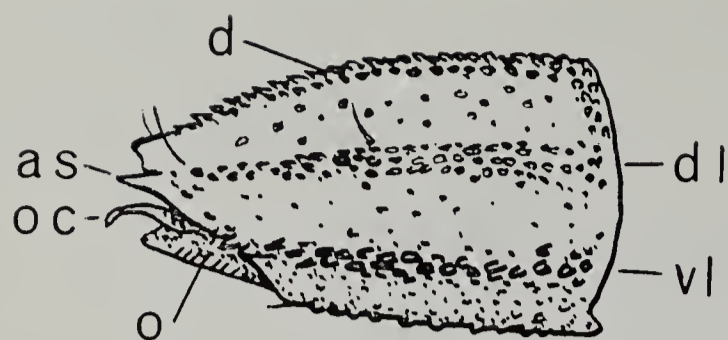
Description of Mature Larva of *N. boeseli* sp. n. (Figs. 37-49)

Length, 5.0-6.0 mm; breadth across prothorax about 0.75 mm, increasing to about 0.80 mm across mesothorax, about 0.85 mm across metathorax, and slightly more (sometimes as much as 0.90 mm) across the first 4 abdominal somites. Elongate, subparallel; hemicylindrical to cylindrical (eighth abdominal segment), to pentagonal in cross-section (ninth abdominal segment). Cuticle relatively opaque and dull, fuscous to fusco-cinereous; legs, mouthparts, and antennae paler brown to testaceous. Abdomen on each side with a white line just above the spiracles beginning on the second and extending halfway across the eighth segment.

Head about 0.50 mm wide across eyes and about as long as wide; coronal suture about 0.07 mm long, diminishing from about 0.10 mm at base to about 0.01 anteriorly; frontal suture on each side extending in a curved line to anterior margin of head at inner base of antenna; anterior margin between clypeus and base of antenna with a tooth-like projection which extends beyond the anterior margin of the clypeus, a little more than half the length of the first antennal segment; surface sparsely pubescent, the rather stiff, decumbent hairs being about 0.02-0.03 mm long, projecting anteriorly, and most conspicuous on the sides of the head; with a few longer (up to about 0.1 mm), finer, curved setae near eyes and bases of antennae; setae of anterior margin of frons delicate, ramose, those near middle about 0.025 mm long and branching from base (Fig. 37), increasing in size toward the sides to those near the large teeth of the margin which are about 0.060 mm long (extending well beyond the teeth) and branching all along the length of the main axis (Fig. 38); tubercles of anterior margin of frons forming a row of blunt spines ranging in length from about 0.007 to 0.018 mm, those near the lateral teeth being larger; epicranial tubercles mostly double on anterior two-thirds of head, each bearing an inconspicuous seta; epicranial tubercles on basal third flattened, scale-like (Fig. 39) in region normally withdrawn into prothorax.

Thoracic and abdominal tergites rather uniformly armored with tubercles in exposed regions, the tubercles mostly bicuspid and somewhat larger than those of the head. Pronotum with major cusps of tubercles directed anteriorly except along posterior margin; near basal third of pronotum on each side, almost halfway from midline to lateral margin, there are two small granular patches devoid of tubercles, a seta arising from the more dorsal one. Other isolated setae arise from the anterior and lateral margins. Mesonotum, metanotum, and abdominal tergites with tubercles directed posteriorly, the surface between the tubercles being alutaceous. Each segment with an isolated lateral, laterodorsal, and dorsolateral seta on each side. Each of these segments with anterior border (in the portion which can be retracted within the preceding segment) devoid of tubercles except for a single row which probably serves an anchoring function (Fig. 45); this region appears alutaceous at low magnification but is composed of flattened scales which are imbricate on at least parts of these "collars" on the mesonotum, metanotum, and first two abdominal tergites. Posterior margin of all segments except ninth bordered by a close-set row of tubercles from which arise flattened setae which project inward and posteriorly; these setae appear to overlap and grip the anterior row of tooth-like tubercles (Fig. 45) of the succeeding segment. Similar transparent setae project forward beneath the anterior margin of the pronotum.

Prosternum alutaceous, with tubercles directed anteriorly as on pronotum, but more widely separated, especially near anterior median border where the marginal tubercles are flattened and truncate (Fig. 40). Mesosternum and metasternum alutaceous, the anterior two-fifths partially covered by imbricate scales; tubercles restricted to raised antecoxal region and pleurites, though the anterior pleurite on each segment is almost devoid of tubercles; tubercles directed posteriorly. Median region of mesosternum, metasternum, and anterior part of first abdominal sternite slightly raised, forming a modest carina. On abdominal segments one to



47



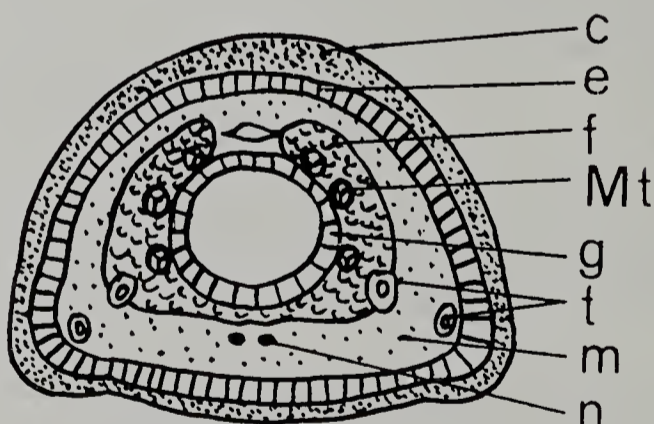
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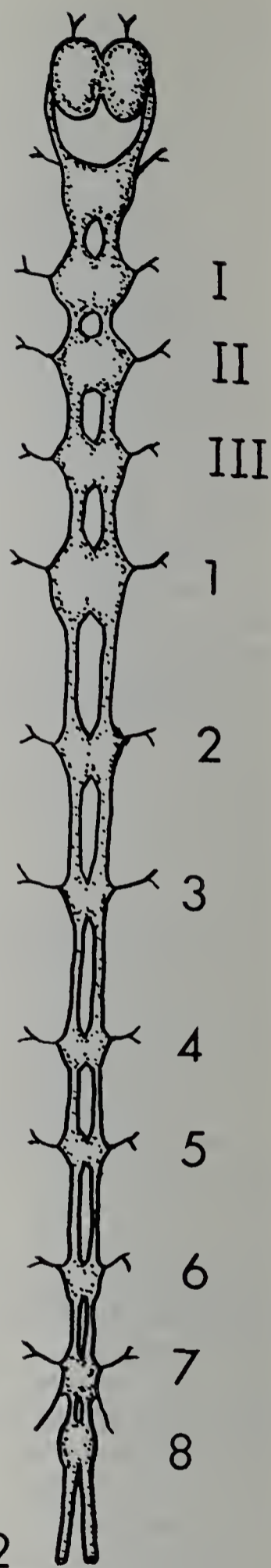
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Fig. 47. *N. boeseli* sp. n., ninth abdominal segment of larva, lateral aspect. Key to abbreviations: *d*—dorsal carina, *dl*—dorsolateral carina, *vl*—ventrolateral carina, *o*—operculum (slightly open), *oc*—opercular claw, *as*—apical spine or tooth.

Fig. 48. *N. boeseli* sp. n., ninth abdominal segment of larva, dorsal aspect. Abbreviations as in Fig. 47.

Fig. 49. *N. boeseli* sp. n., operculum of ninth abdominal segment of larva, ventral aspect.

Fig. 50. Diagram of a cross section through the ninth abdominal segment of a mature larva of *Neocylloepus* sp. to show the relationships of the carinae.

Fig. 51. Diagrammatic cross section through abdomen of mature *Neocylloepus* larva. Abbreviations: *c*—cuticle, *e*—epidermis, *f*—fat body, *M t*—Malpighian tubule, *g*—gut, *t*—tracheae, *m*—muscle, *n*—nerve cord. (Adapted from a drawing by Mr. Edwin A. Green.)

Fig. 52 Diagram of central nervous system of mature larva of *Neocylloepus*. Thoracic ganglia are indicated by Roman numerals; abdominal ganglia are indicated by Arabic numerals. (Adapted from a drawing by Mr. Edwin A. Green.)

eight, the posterior margins of the sternites and pleurites are bordered by small tubercles which are usually tricuspid, the median cusp being longest. Ninth abdominal segment (Figs. 47, 48) on each side with lateral margin of apex projecting posteriorly as a prominent tooth about 0.04 to 0.05 mm long, fringed with inconspicuous transparent setae. Margin between teeth bordered by smaller, tooth-like, projecting tubercles. Leg (Fig. 44) and operculum (Fig. 49) as figured. Lateral apex of coxa usually produced. Spiracles opening on small tubercles. Larvae of earlier instars lack the spiracles and white lateral line, as well as exhibiting smaller dimensions. Those I have observed are also less dusky in coloration, being essentially testaceous.

Specimens: U. S. A.: Texas—Devil's River about 20 miles south of Juno: 5 larvae collected in August, 1967, and 28 larvae collected at the same locality in May, 1969. Most of these are mature.

Comparative notes: This larva differs from the others in its larger size, more prominent apical teeth on the last segment, proportionately narrower head, tricuspid tubercles on the posterior margins of abdominal sternites with the middle cusps predominant, and in having typically only two bare patches (devoid of tubercles) on each side of the pronotum. It also appears to differ in having at least a few small tubercles on the anterior pleurites of the meso- and metathorax, although these are very difficult to observe.

Description of Mature Larva of *N. sculptipennis* (Sharp)

Length, 3.4-4.2 mm; breadth across prothorax 0.60-0.63 mm; across mesothorax 0.625-0.64 mm, across metathorax 0.65-0.675 mm, across first 4 abdominal segments 0.675-0.72 mm. Ninth abdominal segment about 0.7-0.8 mm long, the apical teeth ranging from about 0.005 to 0.025 mm long. Head about 0.395 mm wide and 0.355 mm long, with the lateral teeth of the anterior margin of the frons 0.02-0.04 mm long. Labium about 0.213 mm long and 0.192 mm wide; widest near middle, tapering anteriorly from this point. Pronotum with several (3 or 4) small bare patches on each side. No tubercles observed on anterior pleurites of meso- and metathorax. Tubercles of posterior margins of abdominal sternites appear bicuspid, or if tricuspid, the middle cusp does not predominate. Except for the features mentioned above, the description of the larva of *N. boeseli* sp. n. applies to this species insofar as I have been able to observe. The immature larvae also differ from the mature ones in the same respects, i.e., no spiracles or white lateral line, testaceous coloration.

Specimens: MEXICO: Estado de Chiapas—north of Arriaga, 1 larva in October, 1966; Estado de Guerrero—1 near Xaltianguis and 1 near Playon in March, 1969; west of El Ocotito, 35 in April, 1969; south of Tierra Colorada, 7 in April, 1969; near El Cuarenta, 2 in April, 1969. GUATEMALA: Departamenta de El Progreso—near San Cristobal Acastoquastlan, 1 in October, 1966.

Comparative notes: This larva differs from that of *N. boeseli* sp. n. in having more than two bare patches on each side of the pronotum, no tubercles on the anterior pleurites of meso- or metathorax, and tubercles lining the posterior

margins of abdominal sternites 1-8 which lack a prominent central cusp. From the larva of *N. sandersoni* sp. n. it differs in possessing distinct apical teeth on the ninth abdominal segment and in being proportionately slenderer.

Description of Mature Larva of *N. sandersoni* sp. n.
(Figs. 35, 36)

Length, 3.50-4.20 mm; breadth across prothorax 0.60-0.65 mm, across mesothorax 0.65-0.70 mm, across metathorax 0.67-0.73 mm, and across first 4 abdominal segments 0.72-0.75 mm. Ninth abdominal segment 0.73-0.75 mm long, with no apical teeth or with but rudiments of teeth. Head about 0.47-0.50 mm wide. Midventral carina of mesothorax, metathorax, and first abdominal segment poorly developed as in *N. sculptipennis*. In other respects, the description of *N. boeseli* sp. n. applies reasonably well to this species. Again, the immature larvae differ from the mature ones as described for *N. boeseli* sp. n.

Specimens: COSTA RICA: Provincia de Puntarenas—small river west of Canoas, 6 in November, 1966. PANAMA: Provincia de Panama—Rio Pacora north of Pacora, 4 in June, 1968.

Comparative notes: This larva is distinctive in lacking apical teeth on the ninth abdominal segment; it is also proportionately broader than either of the other species described above.

ACKNOWLEDGMENTS

This investigation was supported in part by the Faculty Research Fund of The University of Oklahoma. Figures 51 and 52 are based upon drawings provided by Mr. Edwin A. Green, who is engaged in a study of the comparative morphology of dryopoid larvae.

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- DESCRIPTORS: Coleoptera; Dryopoidea; Elmidae; Neocylloepus; new genus; description; keys; new species; Texas, Mexico, Central America.

2.0001. *Neocylloepus*, a new genus from Texas and Central America (Coleoptera: Dryopoidea: Elmidae)

ABSTRACT—The genus *Neocylloepus* is created to include *N. (Elmis) sculptipennis* Sharp 1882, *N. hintoni* (= *Cylloepus sculptipennis* as redescribed by Hinton, 1940) in the Mexican states of Mexico and Morelos, *N. boeseli* from Devil's River, Texas and the state of Nuevo Leon, Mexico, *N. arringtoni* from Rio Axtla in southeastern San Luis Potosi, Mexico, *N. petersoni* from northern Chiapas, Mexico, and *N. sandersoni* from Costa Rica and Panama. The range of the type species, *N. sculptipennis*, extends from the state of Nayarit in Mexico through Guatemala and Honduras to northwestern Nicaragua. Two of the new species being based upon unique male specimens, the species key is based largely upon male characters, especially those of the genitalia. *N. hintoni* is based upon Hinton's description. Types of the other 4 new species are deposited in the Stovall Museum of Science and History, Norman, Oklahoma. A total of 142 adults and 91 larvae were examined. Since both adults and larvae key out to various other genera (*Cylloepus*, *Elsianus*, *Microcylloepus*, and *Neaelmis*) in existing keys to the elmids of Mexico and the United States, modifications of the keys of Arnett, Bertrand, Hinton, Leech and Chandler, and Leech and Sanderson are presented for the insertion of *Neocylloepus*. This genus is probably closest to *Hexacylloepus*.—H. P. BROWN.

FIELD NOTE

3.0002 **Additional Distributions for Species of *Phratora* Chevrolat.**—The genus *Phratora* Chevrolat has been revised by Brown (1951, Canadian Entomol., 88, pp. 121-130), who also recorded new distributions for this genus in two subsequent papers (1952, Canadian Entomol., 84, pp. 335-342; and 1961, Canadian Entomol., 93, pp. 967-977). A study of specimens in the South Dakota State University Insect Collection and those collected by the author has shown some interesting new distributions.

Of prime interest is *Phratora interstitialis* Mannerheim. A single male of this species was collected by sweeping at Crooks Tower Lake in the Black Hills, Lawrence County, South Dakota, August 4, 1967, elevation 7140 feet. No host plant was noted. Both external characters and features of the aedeagus refer it to this species. Heretofore easternmost records were from Great Slave Lake, Northwest Territories, and southernmost from east-central British Columbia. Thus, this specimen, in addition to simply being a new state record, represents an extension of range of more than 950 miles.

Brown (1961) indicated that the range of *Phratora frosti remissa* Brown included the Black Hills, South Dakota. I have collected five Black Hills specimens in Lawrence County, South Dakota, and the S.D.S.U. Insect Collection contains six other specimens: five from Medicine Bow Lodge, Colorado, and one from Sherridon, Manitoba.

A third South Dakota *Phratora* species is *P. purpurea purpurea* Brown. The following records for this species represent the southwesternmost known distribution and also a new state record. Although recorded from as far west as British Columbia *P. p. purpurea* has, until now, been reported no further south than eastern Ontario, or, in the Midwest, Riding Mountain, Manitoba. The South Dakota records now extend its range at least 460 miles. This material includes the following Black Hills specimens: two from Sylvan Lake, Custer County (previously determined by H. S. Barber as *P. americana* Schaeffer, prior to Brown's recognition of *P. purpurea* as a distinct species), one from Sturgis, Meade County; three from Lead, twelve from Pluma, twelve from Englewood, five from Hanna Campgrounds, Lawrence County; and one from Mickelson and three from Ditch Creek (four miles south of Deerfield), Pennington County. One specimen from 100 miles east of the Black Hills, Kennebec, Lyman County, also is in the S. D. S. U. collection. An additional new state record for this species is a single specimen, which I collected ten miles south of Red Lodge, Carbon County, Montana. Edward U. Balsbaugh, Jr., South Dakota State University, Brookings, South Dakota 57006.

DESCRIPTORS: Coleoptera; Chrysomelidae; *Phratora*; S. Dak., Mont., Col., Manitoba, B. C.